

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

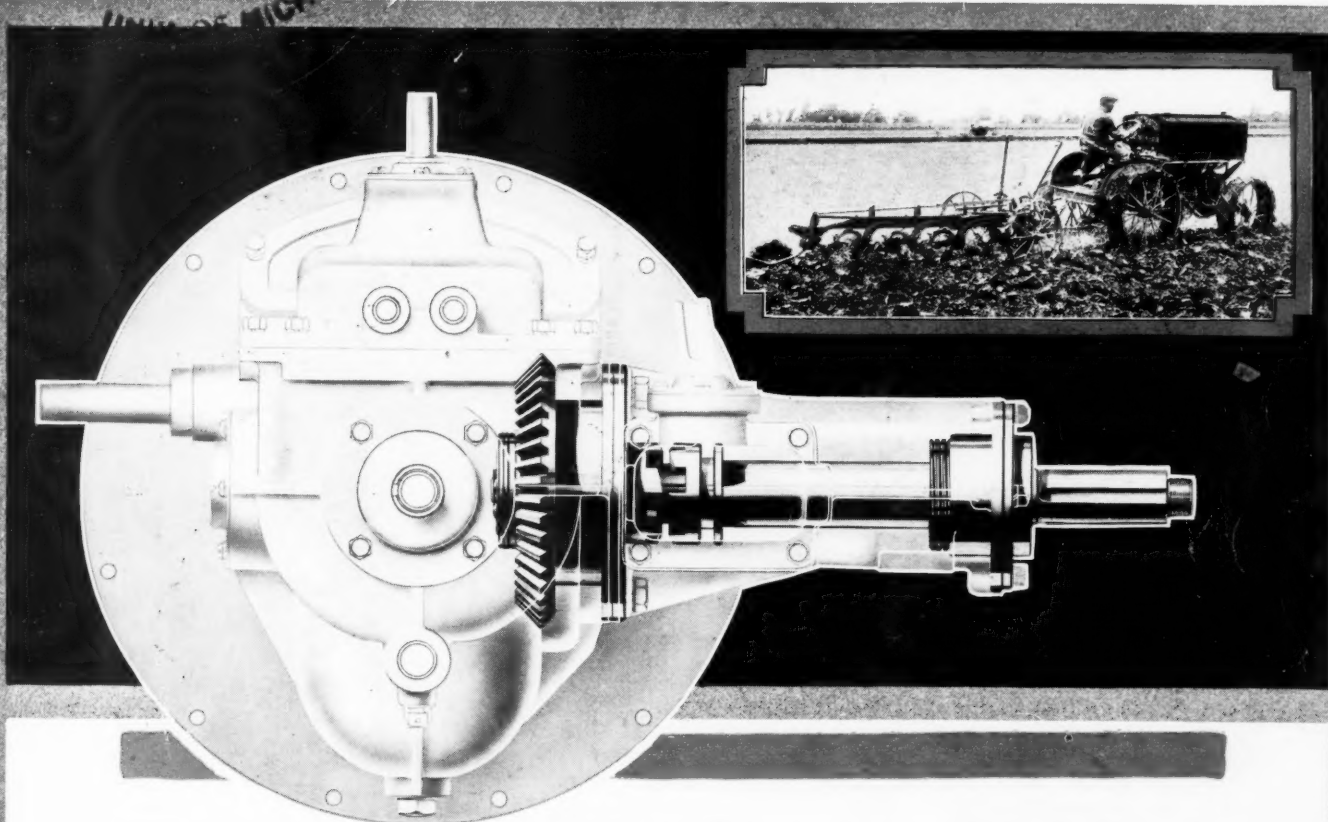
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Tractor Gears Always in Mesh

A Tractor transmission must do harder work than a transmission in any other automotive type.

A Tractor transmission should spare its gears for the work they are designed to do. In the Cotta Transmission gears are always in mesh. Speed changes are made by the engagement of jaw clutches.

Note in the photo above the compactness, simplicity, and superiority of design of power take-off which can be applied to either side of the tractor.

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COTTA TRANSMISSION COMPANY
ROCKFORD, ILLINOIS

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TRUCK-TRACTOR
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The Last Word in Spark Plugs—An Instantaneous Hit!

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Is absolutely compression-tight. Gives more power, greater flexibility and economy.

Stewart-Warner Speedometer Corporation, Chicago, U. S. A.

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLI

NEW YORK—THURSDAY, JULY 17, 1919—CHICAGO

No. 3

Need of Test Demonstrations Is Wichita Lesson

Ninety Minute Plowing Exhibition, Without Test Records, Is Classed as "Agricultural Vaudeville" by One Manufacturer—Attendance Less than Formerly and Less Valuable to Farmer than Watching His Neighbor—Parrett Stages Excellent Demonstration, Fordson an Interesting One

By David Beecroft

WICHITA, KAN., July 15, 1919.

AFTER one day of plowing with the actual plowing test beginning at 1:30 p. m. and ending at 3 p. m., the conviction is stronger than ever with tractor manufacturers that inconclusive tests, such as the present one, do not satisfy the manufacturer or even the consumer and that it is not worth the time and expense to come all the way to Kansas just to show a few spectators that tractors will plow.

One large manufacturer, who has more than 1500 of his tractors in use in this portion of the state, condemned the present demonstration by saying that any prospective buyer would not come to the demonstrations but go to the farmers already using the tractors, and that, in so far as the present demonstration is intended as a demonstration to the farmer, it is practically useless and not of sufficient duration to convince him.

Whether the present tractor spectacle is designated a national demonstration, or otherwise, does not alter the fact that, so far as attendance is concerned, the demonstration is not any more national than were

those demonstrations held at Denver, Macon, Walla Walla and Sacramento.

The present demonstration is a national one from the manufacturers' viewpoint but not from the viewpoint of the farmer or the distributors and dealers. This should be the last of such so-called national demonstrations, that are not truly so in character.

Tractor manufacturers are convinced of the necessity of staging truly national demonstrations but the rules must be framed for the usefulness of the manufacturer and the character of the demonstration must be such as to give the manufacturer a run for his money, in a word he must get more in return for the money, time and energy expended.

He gets very little this year because, judging by to-day, the attendance is going to be small compared with former years, due partly to the fact that threshing is very late and the weather uncertain, the Kansas farmer cannot afford to leave his farm for a single day, if there is any prospect of getting his wheat threshed, which has been standing in the shock for three weeks or longer. Really there is not much to attract him to the demonstration, for he realizes that the rules are practically no rules at all, and any cheap kind of tractor can get away with ninety minutes of plowing about as

well as the best make. There is nothing to tell him the speeds of the different machines in actual work and there are no records of stops that the tractors have had to make, and what has been the cause of each stop.

In a word the demonstration is just a spectacle or as one manufacturer put it to-day, a kind of "agricultural vaudeville."

The manufacturers all admit that never before in tractor history was a real annual demonstration so essential to the tractor industry as at present. A demonstration, with rules that will assist in clarifying the problems of design, is needed. The rules must follow the French and British standards in which every tractor is accompanied from start to finish by an observer who makes a complete record of every stop, with the cause, and the amount of man-minute work required to remedy the trouble.

With such rules, the tractor would be required to perform well up to its advertised standard of speed ten consecutive hours, and not for ninety minutes. With such a demonstration the weak designs will be ferreted out. The camouflage will be removed and the makers will go home with a pocket full of notes and reports that will be more than an ordinary sermon for the engineering department and for the sales department as well.

With such a demonstration it is not essential to designate a winner, but there should be official reports of the work done by each tractor and such reports should be given to every entrant in the demonstrations. Weaknesses will have to come to the surface.

It is useless for the good in the industry to be saddled with a millstone of inefficiency and to continue demonstrations that seem to be framed to conceal, rather than expose, the millstone of inefficient design.

The evolution of tractor design, as indicated by the present demonstration, is not assuming definite shape so quickly as was anticipated, partly due to the broad ramifications of agriculture and the possibilities of using varieties of design. There are very few new tractors here and only a few of the old ones are showing recent improvements.

Most noteworthy is the changing of the Wallis three-wheel, which was the pioneer of the modern tractor design, to the four-wheel classification. For more than two years the company has had its experimental four-wheel job on experimental work but this is the first time it has been handed to the public. The conversion has been made without changing any of the engineer chassis design and a conventional good design of forged

axle is used with the much desired small diameter wheels.

The Cleveland, or Celtra creeper, is out with a new creeper tread of lighter weight than formerly and with creeper plates with a vertical end piece that takes better hold of sod and hard surfaces. It also has a new design of water air washer which is sensibly placed outside of the hood, instead of being cramped under the hood as is so often the case.

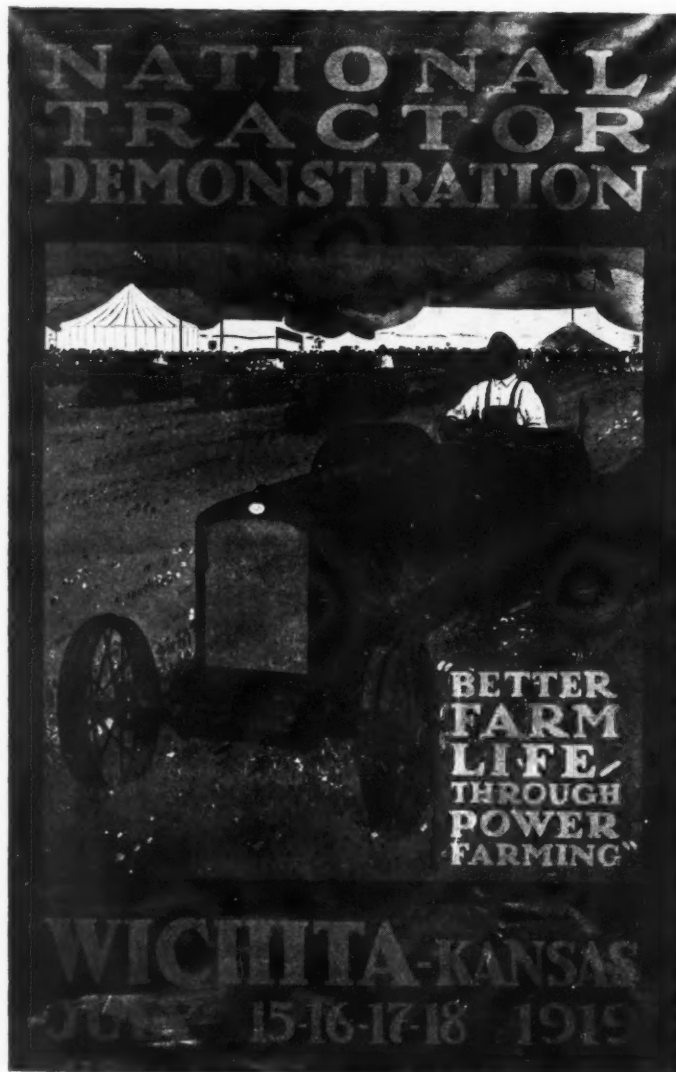
California is better represented than at any previous demonstration with two makes, the Best and the Bean, both of characteristic creeper design. The Best is one of the pioneer creepers using two creepers, one at each side, and steering by declutching one of them.

The Bean is in two models, one with a four-cylinder engine and the other with a two-cylinder V-design. Both designs of Bean machines are much alike excepting in the engines. The Bean uses but one creeper, which is placed centrally ahead, and grouped around it are the engine, gear box and everything but the driver's seat and a pair of wheels that pivot to the rear end of the creeper frame. The creeper part is hinged to the rear wheeled part and is free to rise and fall in mounting the ground surface without imparting any of the wave-like motion to the operator, who sits as comfortably as on any make of machine. Both of the models are two-plow machines and are exceedingly compact. They are readily convertible for any form of orchard work, being made specially low, and they lend themselves well for row cultivation, as the creeper unit is narrow enough for any row crops. With extension controls, the operator sits on the cultivator or other implement which takes the place of the two rear wheels. The universal character of the design has

strong appeals and the working of the two-cylinder engine has been very favorably commented upon.

The creeper design has more followers at this demonstration than at former ones and its followers include Holt, Best, Cletrac, Bean, Monarch, Bates and a new job, the Wolverine, which makes its debut this week. It is an exceedingly heavy type with two forward steering wheels and a central forward creeper. On each side of the creeper, at its rear end, is a balance wheel which also comes into use in case the creeper sinks deeply. The field of the creeper type is stronger to-day than a year ago.

One engineer looks to the near future when creeper shoes will be stampings, or perhaps forgings, and when their weight will be reduced and their lives be that of any part of the tractor.



The tractor makers are not shouting kerosene nearly so loudly as a year ago, but notwithstanding this fact, more tractors than ever before are using kerosene. Many of them are using it under protest and emphatically declare that kerosene is the thorn in the side of the tractor industry and that they wish they never had attempted to use it. They are changing lubricating oil much more frequently than should be necessary and there is a very high maintenance cost.

Tractor service would be very materially simplified with gasoline as a fuel instead of kerosene. One old-time maker went so far to-day as to declare that ninety per cent of the service troubles could be traced to the use of kerosene. With one maker, the trouble shows as engine bearing jobs; with another, it is piston ring trouble, and with other difficulties traceable to imperfect lubrication. Over many tractors to-day there was a continuous cloud of smoke. In fact, at a distance, you could imagine it was a coal burning steam engine. There are others that get away with it with scarcely any smoke, some with none at all.

To-morrow the cultivators, of which there is a real array this year, are to demonstrate officially but they are only going to be allowed to make two rounds on the field. Such a demonstration is practically useless, particularly as no report of any character will be made.

Further evidence of the influence tractors are having on farm machinery was evidenced by the new International Harvester Co. binder, which has its cutting and other working machinery driven from the tractor engine, rather than being driven from the large wheel which carries the binder. In a word the binder, cannot be used but with a tractor, for without the tractor it has no wheels to carry it. This is the first job of this kind that has been developed and from the forty experimental jobs out, the best of reports have been

received. The job is so successful that it can be considered as marking a new epoch in binders. With the small four-cylinder tractor the job lists at the remarkably low figure of \$1000.

A round of the exhibits brings to the surface the old knocking policy against Fordson and the new Samson, built by the General Motors. It is unfortunate the Samson is not here. It is unfortunate that so many of the makers fail to realize the part that these two firms are destined to play in the industry. Instead of being considered strong missionary factors and appreciated as such, too many of the old makers are resorting to the pre-historic method of knocking and if half the reports told you about Fordson were true, it would be off the market before this. So many of the reports are so ridiculously silly that they reflect on those who repeat them.

Parrett and Fordson deserve congratulations for staging private tests. Parrett is just about completing one of the most complete public demonstrations ever staged in this country, that of harvesting, threshing and then plowing one field of 127 acres. The job should be finished to-morrow. The test has been conducted by the Kansas State Agricultural College, which has a corps of observers, and every minute has been observed and reported upon and kerosene, oil and water measured. It has been a masterly job. It has not been spectacular, non-stop, but rather a sane demonstration such as hundreds of farmers actually should be doing every day in July and August.

The Fordson distributor is just about completing a thirty-day farm demonstration which, unfortunately, has not been under official supervision and its main purpose will serve as conviction as to the Fordson's ability for all those in this vicinity who have watched it.

More of the Parrett type demonstrations are needed.

Parrett Puts on Closely Checked Harvesting and Plowing Test

WICHITA, KAN., July 14.

TO demonstrate officially the capacity of a tractor in the wheat belt in harvesting, threshing and plowing for another crop a Parrett tractor was started June 26 in a 127-acre field of winter wheat to harvest it, thresh it and plow the field. Harvesting and threshing have been completed and the plowing is nearly completed, which, when completed, will mark the finish of one of the most comprehensive tractor tests of an official character that has taken place.

Official character was added by having it conducted by officials and observers from the Kansas State Agricultural College, Manhattan, Kan., as Prof. F. F. Frazier of civil engineering is in charge and he has three students who have acted as observers so that not a minute since the start on June 26 has not been under official scrutiny. Carefully prepared reports have been made concerning kerosene and oil required as well as water needed in radiator and also in the air washer.

The official report also shows the time required for each operation and the exact number of stops, the length of each in minutes and seconds, and the cause of each. In a word it is a most complete report and one that will furnish what the tractor industry so badly needs, namely, some official figures on performance in various lines of farm work.

It is fortunate that some makers have undertaken offi-

cial tests of this character, as such tests furnish the only official figures on performance that will come from Wichita this week. The National Tractor Demonstration held here is entirely wanting in records. The rules take no recognition of fuel consumption, speed of plowing in the tests, stops, etc. The tractors simply start plowing and when they get through they stop and the public is none the wiser as to the exact performance.

The Parrett test has been on what is known as the Royal Farm, nine miles out of Wichita, and the test has been on a fairly level field of 127 acres of winter wheat. The wheat was cut with an 8 ft. binder which required 52 hr. and 54 min. of actual working time. The binder was so coupled with the tractor as to permit of one man operating both, which was possible by extension tractor controls, permitting the operator riding on the binder.

The Parrett company developed this one-man system some months ago and in the test it worked entirely satisfactorily. While one man can do the work successfully, it is a man's job. Kansas wheat this year has heavy straw which did not stand up as well as generally and the binder task was specially exacting.

The total harvesting time, including stops due to tractor and binder, was 71 hr. and 59 min. The kerosene used was 1.11 gal. per acre, or 2.68 gal. per hour. The rate of harvesting was 1.76 acres per hour. No attempt was made to run the tractor night and day continuously as the test

Scenes of Harvesting Tractor Test



General view of 127-acre field, scene of test



12-25 tractor drawing an 8-ft. binder. One man operated the combination, all of the time, by an extension control apparatus



Two tractors hauling two trailers each, collecting the wheat from the field and drawing it to the threshing machine. Six trailers were used, two always being unloaded at the threshing machine



The tractors under test drove the threshing machine throughout. Two other tractors hauled the wheat to the threshing machine

was not an engine non-stop test. It was a test similar to that any farmer would give.

The harvesting was carried on until midnight and sometimes later until the wheat was too damp to cut and work was put off until eight or nine in the morning. Threshing the wheat proved as good a tractor test as cutting and of equal importance, as nearly 50 per cent of the tractor's work is belt work such as threshing. Threshing was almost entirely a tractor job, as two extra Parretts were used to draw the wheat to the 23-in. threshing machine which the tractor under test operated.

The threshing test was not continuous, as rain interfered and a delay of three days was caused by this, and the tractor was stopped as the farmer would have to do. The gross threshing time practically equalled the harvesting or cutting time. It was 72 hr. and 10 min., but the net threshing time was 61 hr. and 12 min. The difference between gross and net was due to stops by the tractor because of the threshing machine.

Threshing was done at the rate of 2.1 acres per hour. The kerosene used was 1.89 gal. per hour or approximately 9/10 gal. per hour more than needed for harvesting.

Water added to the radiators amounted to 47 gal. and to the air washer 13 gal. Total tractor stops for threshing were 1 hr. 21 min., largely due to carbureter adjustments, repairing fan belt and attention to air washer. There was one carbureter adjustment of 13 min. and another of 7 min. Most of the trouble with the tractor occurred at night, especially that of the fan belt which also happened in plowing. The plowing of the 127 acres is not yet completed but is more than half done.

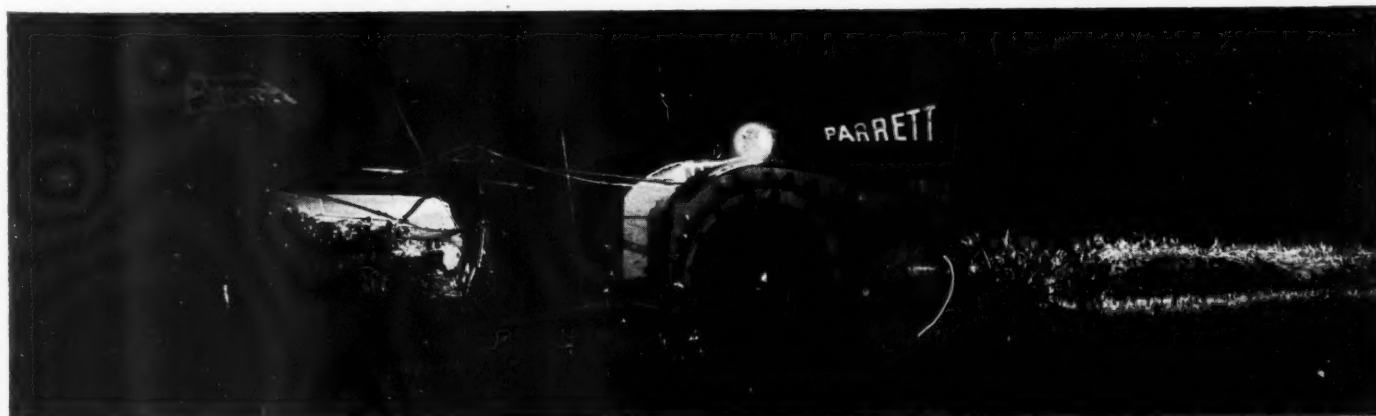
In this part of the test the tractor is operating 24 hr.

a day with four shifts of operators and four shifts of observers. The tractor is pulling three 14-in. Oliver plows working 6½ to 7 in. deep. It is averaging slightly over 1 acre per hour. Thus far there have been few plowing stops due to the tractor.

One night the fan belt lacing broke, which resulted in damaging the return water hose to the radiator and the delay totaled 1 hr. and 40 min. Another night the gear-shift fingers in the gearset stuck and there was a delay of over one hour. There have been a few changes of spark plugs since the test was started.

In order to get as complete information as possible the oil used in the engine crankcase has been measured and drained off every 30 hours. In harvesting, the oil consumption was at the rate of one gallon for every 50 hours of work. The consumption was arrived at by taking the difference in weight between oil put in and that drained off. No distillation test has been made of oil drained off to determine the amount of unburned kerosene in it. Such test will be made later.

At night a battery is carried for lighting with one light showing ahead on the furrow and one behind on the plow or binder. As most of the troubles with the tractor have taken place at night it is possible that better lighting facilities will be required for night farm work. There is not the opportunity for observing the working of all parts and as most machinery is not over 60 per cent as efficient at night as in the daylight—the combustion engine excepted—it is possible that more lights should be used and an occasional inspection of the tractor made. The tractor, since it started the test, has not been operated more than 25 per cent of its time by factory experts. One



Harvesting was continued until midnight and 1 a. m., when the wheat became too damp and work ceased until approximately 9 a. m., the tractor remaining idle in the meantime with engine stopped



To the left—Agricultural college students measured the oil and checked all supplies. Above—Where observers rigged up a shower bath

of the operators is a 16-year-old boy from Wichita who never drove a tractor before and at the start was not in any sense familiar with the Parrett. Formerly he had driven a jitney. Using inexperienced operators was decided upon in order to make the test approach as closely as possible actual farm operations. J. Levin, factory experimental engineer, is in charge and on the ground all of the time.

Staging a test of this character extending over three weeks is not a small problem. The 127-acre tract was secured last May and Parrett assumed complete responsibility for the complete task. He provided the binder, the threshing machine and the help to do the threshing. It was a completely tractorized test. Over 22 men were needed in the threshing time. A farmhouse was rented, cots rented, cooks and other help secured and a complete working and living headquarters established. Spray baths were installed and an office for the university crew fitted up.

As a result Dent Parrett, president of the company, will have at the completion of the test the most complete and reliable mass of official information that has been accumulated in years. Not all of the National Tractor Demonstrations of the last 4 years would furnish him with what he has obtained.

There has been much good to the industry, but this is the first big attempt to provide that mass of data that the industry should have and that the entire merchandising



Pumping water to house on farm a part of test

organization of the country is in such need of.

A few more tests of this character would do much to put an end to the over-selling and over-rating of tractors which has become too common. A hundred tests of this official character would do more substantial benefit to the industry than a hundred National demonstrations.

Facts on performance is what the tractor industry needs and Parrett is furnishing them.

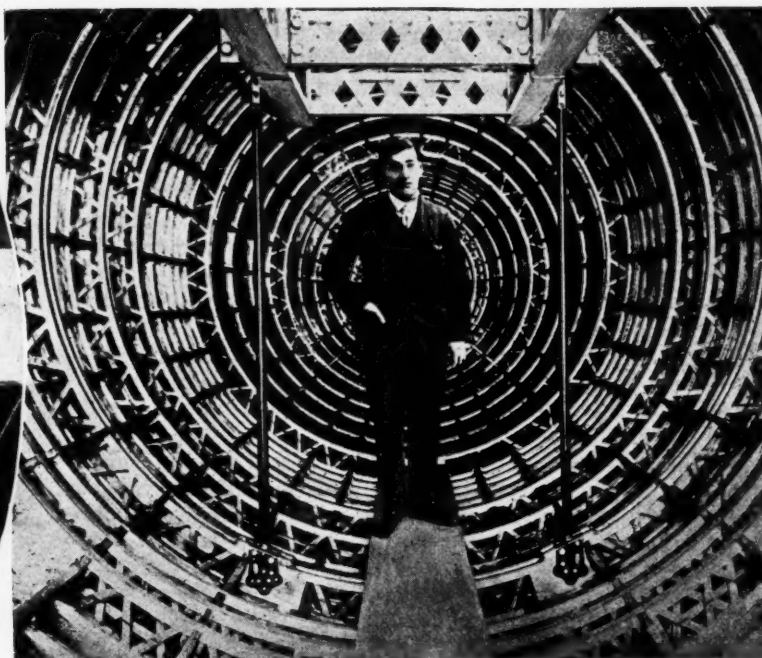
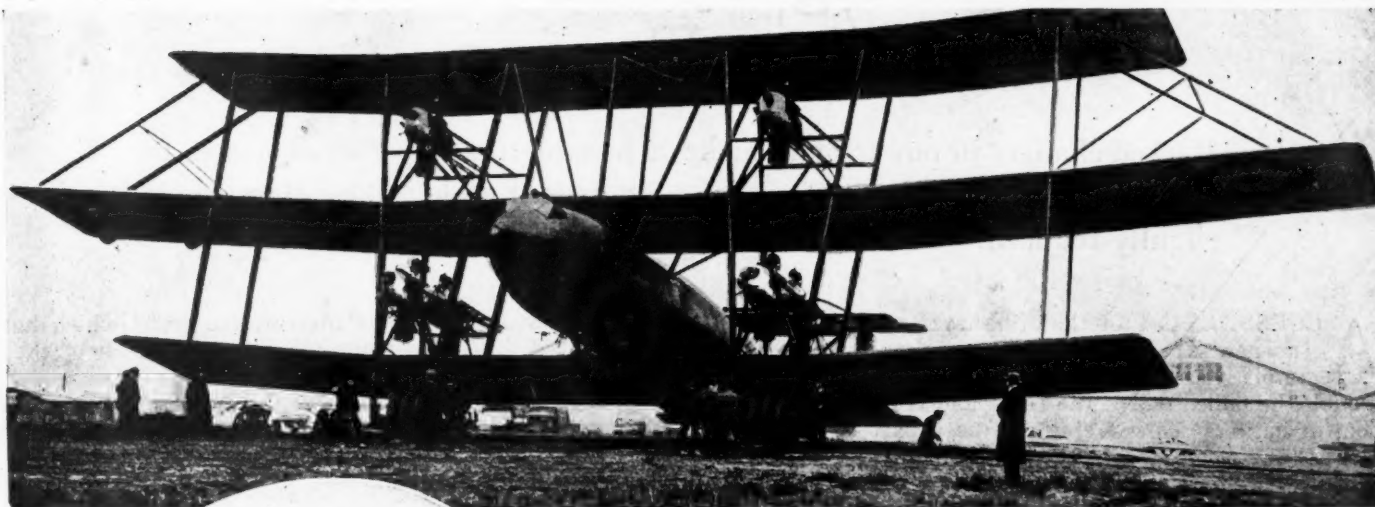
Exporters' Aid Book

EXPORTERS will read with considerable interest the "Export Register," which has reached the third edition. This is rather an exclusive book, each volume being registered, and the buyer is informed that the information is confidential. The text is not thrilling, but each page tells the facts of a different firm that exports American-made goods. There is set forth the firm name, address, telephone number, cable address, codes used, and a history and rating of the house, the names of the buyers, and other information that will be of value. The publishers have grouped all merchandise into several rather arbitrary classes and have numbered the items of these classes. This affords a key to the lines handled by the firm. A

cross index reveals that 950 firms export the classification to which motor vehicles belong, 970 export the machinery group, which includes agricultural and roadmaking machinery, and 900 export the engine group, which includes gas engines and automobile engines and much electrical equipment and appliances. The book is published by the Export Manufacturers of U. S., Inc.

According to the *Aftonblad*, the coal produced at Vöstergötland, Sweden, has the special characteristic of containing the rare and valuable metal vanadium. Analyses show 0.95 per cent of ash, of which 25 per cent is vanadium.

Graphic Story of "Biggest" Airplane



This Tarrant triplane is said by English builders to be the largest heavier-than-air machine ever constructed. At the top is shown the completed triplane. At left, back view of the fuselage. At right, interior view of fuselage. At the bottom, result of effort to make trial flight



Accessible Oiling System Features New Allen Engine

Marked changes in power plant make it possible for lubrication system to be removed through front of engine with little trouble. Bore of engine is slightly reduced. Wheelbase of forthcoming car will be shorter.

ACCESSIBILITY of the oiling system is a feature of the new Allen engine. In redesigning the engine, an oil system has been devised which can, with little trouble, be pulled out of the front and repaired with freedom of action. This engine will be a part of the equipment of the Allen Model 43 car, which will have a two-inch shorter wheelbase than the last model.

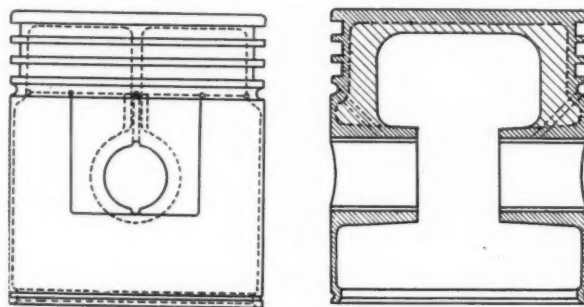
The new engine has a bore of $3\frac{1}{2}$ in. and a stroke of 5 in., its four cylinders being cast in a block. As compared with the previous Allen engine, the bore has been reduced by $\frac{1}{4}$ in. Cylinders are of the "L" head type, with detachable cylinder heads. Engine and transmission are combined into a unit power plant with 3 point suspension. In spite of the reduced piston displacement, the new engine is capable of a greater power output, which is in part at least due to improved manifolding. Much attention has been paid to the subject of accessibility, and an instance of this is to be found in the oil pump, which is bolted to the outside of the crankcase and can be removed after taking out two cap screws. The pump is driven by a pin on the end of the camshaft.

By removing the pump, dropping the oil pan, disconnecting the oil line screw at the center of the engine and taking off the rear connections, the entire oil line can be pulled out of the front of the engine.

Another example of the engine's accessibility is furnished by the push rod guide. By taking off the valve spring cover plate, which can be done by the removal of a

single screw at the center thereof, the crabs which hold the pushrod guides in place are exposed. Each of these crabs is held in place by means of a single screw and by a tongue and groove joint with the cylinder at the rear. By removing the capscrew, the crab comes off, after which the pushrod guide may be lifted out.

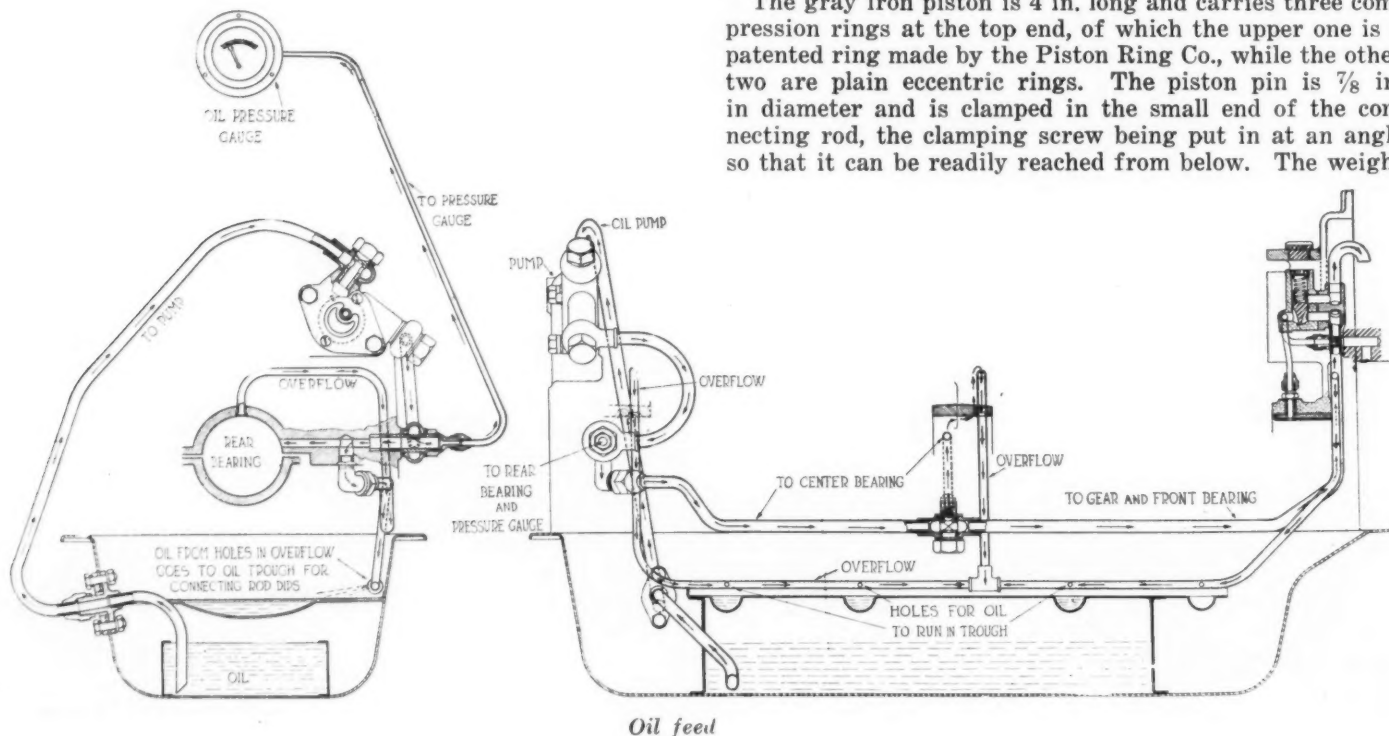
As already pointed out, the cylinder head is cast sepa-

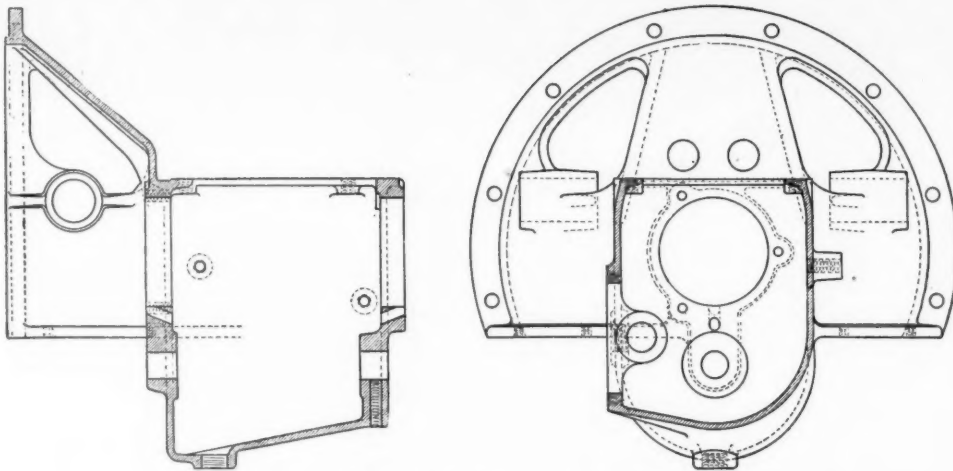


Piston showing three compression rings at the top end

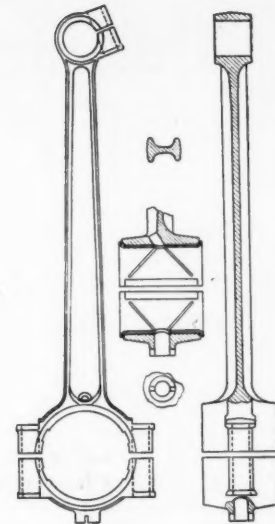
ately from the cylinder blocks, and one of the features of the design is the rigidity with which the head is held to the block. There are 19 studs in the cylinder blocks, each one $\frac{1}{2}$ in. in diameter, which so distribute the load that there is no danger of distortion of the head or valve seats by drawing up on the nuts of the studs.

The gray iron piston is 4 in. long and carries three compression rings at the top end, of which the upper one is a patented ring made by the Piston Ring Co., while the other two are plain eccentric rings. The piston pin is $\frac{7}{8}$ in. in diameter and is clamped in the small end of the connecting rod, the clamping screw being put in at an angle so that it can be readily reached from below. The weight





Two views of transmission case with bell housing



Connecting rod

of the piston without rings is 2 lb. I section connecting rods made of No. 1045 S.A.E. steel are used and are $10\frac{3}{8}$ in. long between centers. The connecting rod and piston assembly complete weigh 5 lb. $4\frac{1}{2}$ oz. The crankshaft is made of the same steel as the connecting rod and is provided with thrust flanges at the center of the shaft. All journals of the crankshaft are $2\frac{1}{8}$ in. in diameter. Especially sturdy crankarms are used, these measuring $2\frac{1}{2}$ x $1\frac{5}{8}$ in. The flywheel flange on the crankshaft is $4\frac{7}{8}$ in. in diameter and is drilled and tapped for six $\frac{3}{8}$ in. cap screws.

Four helical gears are used for the camshaft and auxiliary drives, including one idler, alternate ones of these gears being made of steel and cast iron, respectively. The camshaft is $1\frac{1}{8}$ in. in diameter and is made of case hardening steel. All thrust on the camshaft is taken on a spring and hardened button on the forward end. The firing order is 1-2-4-3. The inlet valves open 10 deg. past the top dead-center and close 44 deg. past the bottom dead-center. The exhausts open 48 deg. ahead of the bottom dead-center, and close 10 deg. after the top dead-center.

The valve springs are enclosed with readily removable plates, one screw holding each of the two plates in place. The valve stem guides are of cast iron, 3 in. in length, the exhaust valve guide being 0.0375 to 0.376 in. in diameter, and the intake valve guide 0.374 to 0.375 in.

The Hot Spot

To provide a hot spot in the inlet passage, the latter is carried past the two center exhaust ports. The exhaust is discharged from the front end of the manifold, the object being to keep the hot gases away from the front compartment, and thus keep the latter cool in summer time. While the thermosyphon cooling system is used, and the jacket space and water connections are made of ample capacity for thermosyphon circulation, provision is made for installing a pump if the customer so desires. The engine and transmission are manufactured by the Allen Motor Co., and other components are purchased.

The Viking type oil pump, a gear design, located outside the crankcase and operated from the end of the camshaft, delivers oil directly to the main bearings, and through an overflow to the timing gears, while a pocket cast in the housing collects oil for lubricating the generator shaft. The return flow maintains a constant level in splash trough. Circulation of the oil is regulated by means of a spring and plunger, located at the front end of the engine, and this regulator can be adjusted by removing the cap above it on the crankcase, just behind the timing gear housing.

The Autolite two-unit starting and lighting system is fitted with switches, etc., on the dashboard. Ignition is by the Connecticut system, with automatic switch.

A 10-in. Borg & Beck dry plate clutch is fitted and is enclosed within the bell housing over the flywheel. This bell housing joins the engine to the three speed and reverse Allen gear set, which is of rather compact design.

Annular ball bearings are used on the main shaft of this transmission, and roller bearings on the lay shaft. At the rear end of the main shaft is a speedometer drive, which is completely enclosed and runs in oil. All gears used in the transmission have a face width of $\frac{5}{8}$ in. Gear reductions between the engine and driving wheels are as follows for the different speeds: High gear, 4.6:1; second gear, 7.95:1; low gear, 14.8:1; reverse, 18.5:1.

Spiral Bevel Gear Drive

A hollow propeller shaft is used and is fitted with two Detroit ball bearing universal joints. The drive is by spiral bevel gears having a face width of $1\frac{1}{4}$ in., and the differential is carried on Bock bearings, while Bower bearings are used in the wheel hub. The Hotchkiss drive is used. Both sets of brakes act on the rear wheels, the service brake being $12\frac{1}{2}$ x $1\frac{3}{4}$ contracting and the emergency brakes $12\frac{1}{4}$ x $1\frac{3}{4}$ expanding. This is an increase over the sizes used last year. All springs are of alloy steel and semi-elliptic, rear springs are underslung.

The Columbia front axle is fitted with Bock bearings, and the steering gears, of Ditwiller make, are fitted with eccentric bushing for taking up wear. Steering gear is effected by means of a 17-in. hand wheel with corrugated rims.

Fuel is fed from a 16 gal. square tank hung at the rear by means of the Stewart Vacuum system. There is a gasoline gage on the main tank.

The car has a 110 in. wheel base, a 10 in. road clearance, and is fitted with 4 in. Miller tires. A one man Fabrikoid top with two plate glass windows in the rear forms part of the equipment. The door curtains open with the doors, and a top boot encloses the bow sockets. The standard finish of the car is dark blue.

The Allen company now occupies the plant formerly used by the Columbus Buggy Co. and the Firestone Columbus. The factory is being entirely remodeled and lined up for an active production schedule of 3,000 cars for this year, with increasing schedules later. The work of moving is not entirely completed, the engine still being manufactured at Bucyrus, Ohio, but within a few weeks permanent arrangements at Columbus will have been completed.

Aluminum Alloy Combines Strength with Toughness

Tests indicate that this new material will find application in parts subjected to shock, such as axle housings and differential Carriers.

A NEW Lynite alloy has been produced commercially which affords the opportunity for further weight reduction in motor cars and motor trucks. This alloy is suitable for automobile parts which up to this time have been made of heavier metals because they call for a higher tensile strength and greater malleability or ductility than obtainable with standard alluminum alloys.

This new alloy is of particular value to the automotive industry in that it makes possible a saving of weight where it is of prime importance, namely, in the unsprung parts, because it is primarily intended for use in differential carriers, rear axle housings and other parts below the springs. From a purely manufacturing point of view, there is an advantage in the easier handling and machining of the lighter metal. This new alloy is not intended to supplant any of the previously known Lynite alloys used for crank cases, cylinder castings, oil pans, pistons, etc., but is intended for parts which require a combination of high strength and ductility.

A good idea of what can be accomplished with this alloy is given by the results of recent tests on a rear axle housing at the Winton Engine Works, concerning which we are furnished the following data by the Aluminum Castings Co. The housing used in this test weighed 90 lb., as compared with 175 lb. for a similar housing made of cast steel. While the cast steel housing showed a permanent deformation of about $\frac{1}{2}$ in. under 6 tons pressure, the Lynite housing, when subjected to this pressure, showed no permanent deformation whatever. After the pressure of 6 tons had been applied the pressure was increased to 7 tons, then to 8 tons, and finally to 9.5 tons, at which point the casting broke. At 7 tons it showed a permanent deformation of only $\frac{3}{64}$ in.

Another test was recently made with a differential housing (Figs. 3 and 4). The housing shown on the right in these two photographs was made of the standard Lynite

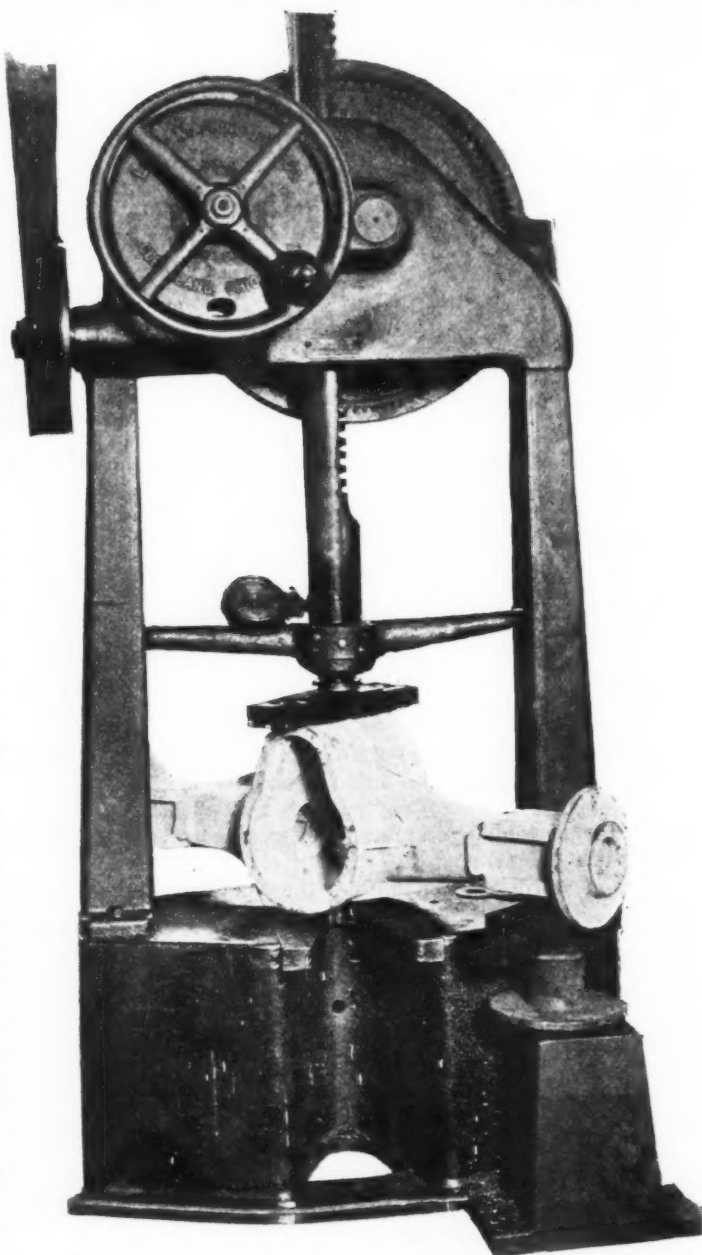


Fig. 1—General set-up of test. Housing supported at each end

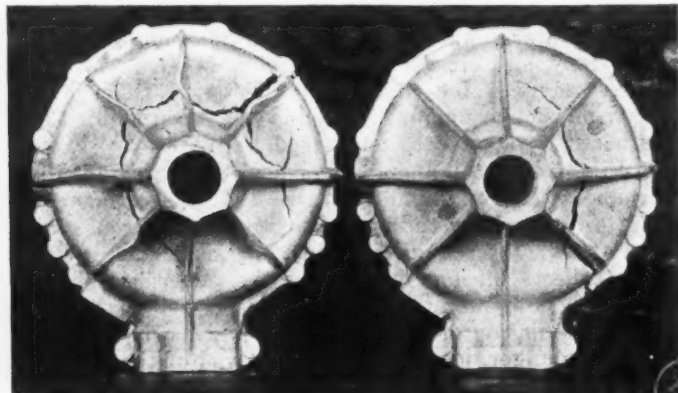
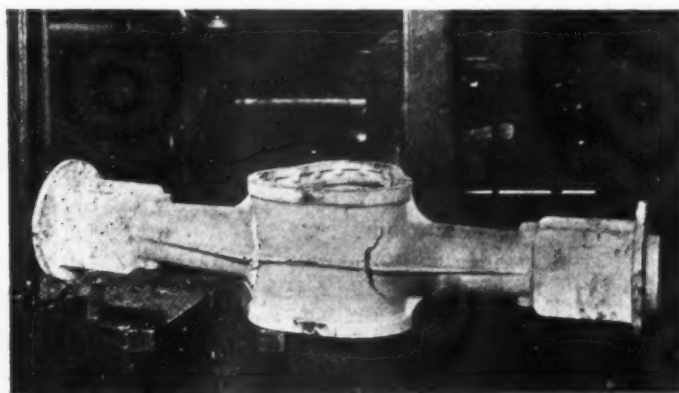


Fig. 2 (at left)—Casting broken by $9\frac{1}{2}$ tons pressure. Fig. 3 (at right)—Casting at the right, made of Lynite No. 112, broke under 36,000 lb. pressure, while casting at left, made of Lynite No. 145, broke at 40,000 lb. pressure, after a reduction in height of $\frac{1}{2}$ in.

alloy, the one most suitable for purposes of comparison (No. 112). The casting shown on the left was made of the new alloy, No. 145.

The casting made of Lynite No. 112 broke when a pressure of 36,000 lb. was exerted on the small end. There was no appreciable reduction in height. The other casting, made of the new alloy, did not break until 40,000 lb. pressure was applied, and then only after a reduction in height of $\frac{1}{2}$ in.

The physical properties of these two Lynite alloys are shown in the following table:

	Lynite No. 145	Lynite No. 112
Specific gravity	2.90 to 2.96	2.81 to 2.86
Tensile strength	27,000 lb. per sq. in.	18,000 to 22,000 lb. per sq. in.
Elongation	4/5% in 2 in.	1.0% to 2.0%
Brinell hardness as ordinarily case, using 500-kg. pressure ...	60 to 70	55 to 70
Merit number	120,000	30,000
Machinability	Good	Good
Pattern shrinkage ...	0.156 in. per ft.	0.156 in. per ft.
Modulus of elasticity.	10 million	10 million
Pounds per cubic inch	0.106	0.103
Pounds per cubic foot	183	177

The merit number is the product of the tensile strength and elongation. Usually, when the tensile strength of a metal is increased its elongation is decreased. When both increase, the product or merit number increases very rapidly. The merit number itself means little unless the various factors entering into the computation of this value are considered. Lead or pure aluminum, for example, would have high merit numbers. In these cases the elongation is high and the tensile strength low. High elongation in-

dictates that the range between elastic limit and ultimate strength is great, and hence the elastic limit itself is very low both in lead and in pure aluminum. These are not valuable as structural materials, because of their low elastic limits in spite of the high merit numbers. It is necessary, therefore, in connection with the interpretation of merit numbers to know both tensile strength and the elongation from which the merit numbers are calculated. Strictly speaking, the actual merit numbers in metals in which the reduction of area is determined involve tensile strength, elastic limit and reduction of area and some constant factor.

In bringing out this alloy the Lynite Laboratories are endeavoring to produce alloys for specific applications and in time to extend the Lynite group to include alloys for as many motor car and motor truck parts as possible.

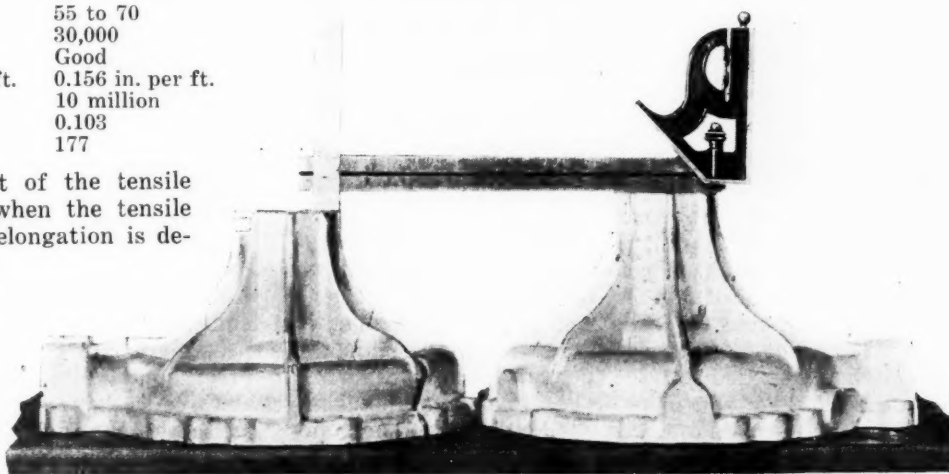


Fig. 4—Shows reduction in height of $\frac{1}{2}$ in. of casting made of Lynite No. 145, tested as described in caption under Fig. 3

Daily "Wind Aloft" Charts Now Issued for the Aviators

THE far flung meteorological and aerological observation system of the Army Signal Corps, operating in conjunction with the Weather Bureau and reporting for the guidance of aviators not only weather and surface air conditions, but wind directions and velocities in the higher altitudes, has been developed to a degree which promises valuable assistance to future cross-country aviation.

During twelve months of experimentation, with observation stations located at army posts and elsewhere throughout the country, it has been demonstrated that upper winds encountered by airplanes differ from those at the surface, while surface air currents are no guide to conditions prevailing aloft. It has been shown also that wind velocity and direction at altitudes from 3000 ft. upward are subject to greater and more sudden changes than those at the surface.

The Signal Corps has developed its aerological work to such an extent that daily bulletins, stating probable conditions for the succeeding twenty-four hours, are issued. These reports, charted by the Weather Bureau at Washington on its own and the telegraphed information of the Signal Corps observers, give conditions at the surface and at the following altitudes: 250, 500, 1000, 1500, 2000, 3000 and 4000 meters.

The Signal Corps' meteorological section records thrice daily at its scattered posts temperature, barometric pressure and other weather features, together with surface

wind data, which are used to supplement the reports from stations of the Weather Bureau. The aerological work, carried on by sending aloft small rubber balloons inflated with hydrogen, whose movements are recorded by specially constructed theodolites, comprises upper air soundings averaging from 6000 to 15,000 ft., depending upon visibility. The highest altitude attained in this service is twelve and a half miles. The "wind aloft" data are obtained at 8 a. m. and 4 p. m. daily, 75th meridian time.

For purposes of local flying the upper air observations reported for the immediate section to the nearest aviation field are more valuable than telegraphic bulletins, as they hold good ordinarily for several hours at radial distances of twenty-five to fifty miles. The general charts are intended for the assistance of cross-country fliers.

Committee to Develop Agricultural Machinery

The President of the British Board of Agriculture and Fisheries has appointed a departmental committee to arrange for the testing, adaptation, and improvement of machines likely to prove of value to agriculture, to examine inventions and new devices, and to advise as to further steps which should be taken to promote the development of agricultural machinery. The secretary of the committee is V. E. Wilkins at the Board of Agriculture, 72, Victoria Street, S. W. 1.

Plan to Use Exhaust Heat in Vaporization of Low Grade Fuels

THE prime importance of this suggestion is that it can be applied to an old truck engine at a nominal expense. In his very interesting article, Mr. Mock tells of building a manifold with a glass side, through which he watched the action of the fuel until he knew exactly where the present trouble lies. Then he set about finding a remedy and he believes that he has found it in the use of exhaust heat. He says this will end the fuel troubles in old trucks.

By F. C. Mock*

THE adoption, in the early days of the motor car, of our system of feeding a number of cylinders in succession through a common intake manifold was based upon the idea that the fuel mixture would consist of air impregnated or carbureted with hydrocarbon vapor. If the original designers of internal combustion motors had supposed that the fuel would not be vaporized, but instead exist as a more or less fine spray in suspension in the incoming air, it is doubtful whether they would have had the courage to construct a motor with this type of fuel intake, for it would have required very little imagination to have foreseen some of the difficulties which we have grown to tolerate in recent years because they have come upon us so gradually.

That our present fuel does not readily change to hydrocarbon vapor in the intake manifolds is indicated by tables of vapor density of the different paraffine series of hydrocarbon compounds, which show that even with elements of 58 deg. Baume gravity and boiling about 340 deg. Fahr., the vapor density necessary for combustion can be obtained only with a vapor temperature above 110 deg. Fahr. This means that for certain vaporization of fuels containing elements of this density the intake manifold must be heated to a temperature a little greater than the hand can touch continuously; and our present gasoline contains a large percentage of ingredients much less volatile than this. I think it is the experience of everyone who has observed these conditions closely that we have almost no difficulty with "carburetion" when adequate mixture temperatures are obtained, and practically all the troubles in this line occur

when the manifold temperature is lower than this point.

To further verify our belief that the fuel could not evaporate in the intake manifold at ordinary temperatures, we built a large tank with conical bottom, in size sufficient to hold about two pounds of air. We have repeatedly put in this 2/15 of a pound of different samples of gasoline and allowed it anywhere from one-half hour to three weeks to evaporate, blowing a draft of air on the surface of the fuel in the bottom of the tank to facilitate its evaporation. With gasoline at 56 deg. Baume gravity from Oklahoma crude we were able to draw off about 60 per cent of the amount we had poured in; with 60 deg. Baume gasoline from California petroleum we drew off about 30 per cent, both of these experiments being conducted while the temperature of the tank was between 68 deg. and 75 deg. Fahr. Repetition of the experiment with different durations of time seemed to indicate that the vapor reached equilibrium in a very few minutes.

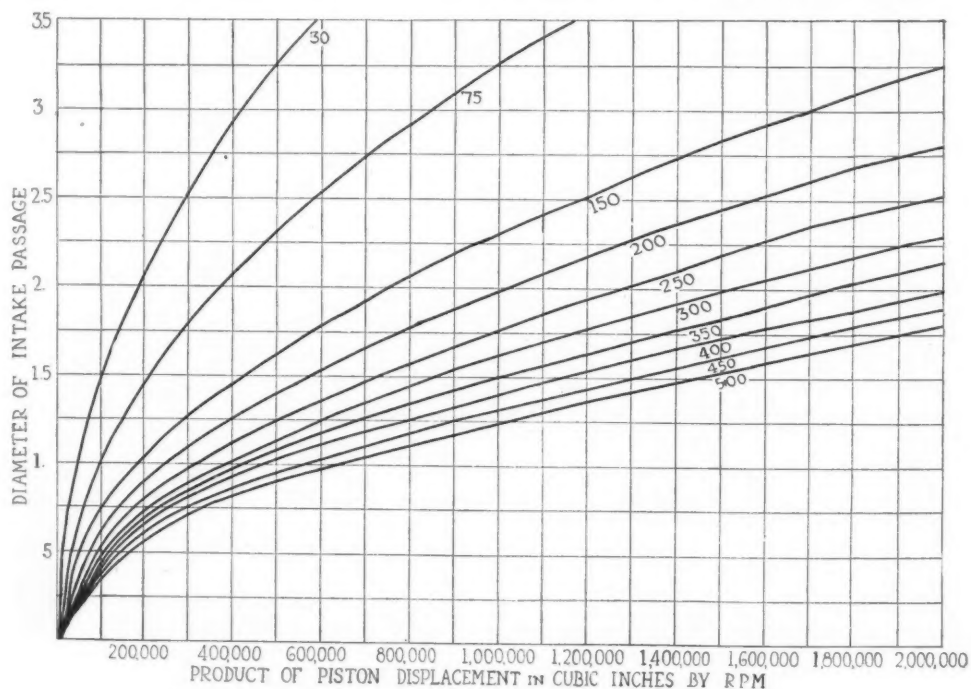


Fig. 1—Curve to simplify computation of air velocities

*Engineer Stromberg Motor Devices Co. Paper read at June meeting of Mid-West Section of S. A. E.

A final definite proof that the fuel does not evaporate in the manifold is obtained when you build windows or glass sections in the manifold and look at it. With the airplane gasoline used in the recent war (I believe about 68 deg. gravity and an end boiling point of 257 deg. Fahr.) the mixture in the manifold was quite wet at 60 deg. Fahr. and became completely dry (at wide-open throttle) at a temperature between 100 deg. and 110 deg. Fahr. With our Mid-West gasoline of about 56 deg. gravity and an end point above 400 deg. the mixture is wet at and below 120 deg. Fahr. at all throttle positions except extreme idle. When the throttle is closed it reduces the air density in the manifold, and if the mixture proportion of the carbureter is properly maintained less fuel will also be fed, so that a lesser vapor density will be required at partial throttle openings. For this reason the mixture will always be more nearly evaporated at closed throttle than at wide-open throttle.

Certain benzol mixture fuels now sold in Chicago are remarkable in that the manifold is dry and the mixture absolutely transparent at wide-open throttle at 80 deg. or 90 deg. Fahr.

When the fuel issues from the jet of the carbureter and sprays out into the air stream we believe that the condition of vapor saturation is reached very shortly after it leaves the jet, and all the fuel that can evaporate at that temperature does so. The remainder continues in the form of small drops, which may either be carried along in suspension in the air stream or, if the air draft is too weak, will fall back and collect on the walls and on the bottom of the air passage. Thus we have a critical air velocity below and above which the action in the manifold and the fuel feed to the motor are radically different. When the air

velocity is sufficient to carry the fuel drops along with it the temperature in the manifold is not so important, and the ability to handle the fuel depends more upon the temperature in the cylinders. For instance, we have known of motors which will fire on kerosene almost as well with a cold small intake manifold of high air velocity as with a heated manifold, provided in both cases the cylinders were sufficiently hot. Also, at high velocities the distribution of fuel to the different cylinders tends to follow the distribution of air fairly closely and is less dependent upon the contour of the manifold bends and curves.

Below this critical air velocity the fuel after leaving the jet slows down (in practically all carbureters the air velocity at the jet is higher than that in the manifold) and in this slowing down the particles tend to drop out of the mixture and settle upon the walls; and when they strike any obstacle or pass around any bend they adhere to the walls and are not wiped off again by the air draft. This develops an accumulation and irregular flow of fuel along the walls, with the result that not only is the rate of fuel feed different to different cylinders, but it is often

different into the same cylinder on successive suction strokes. Another particularly objectionable thing is the time lag between an increase of fuel flow at the carbureter and an increase of fuel flow at the cylinder. When the throttle is opened quickly from a closed position the increased air feed reaches the next cylinder on suction stroke, but the unevaporated part of the increased gasoline feed does not reach any cylinders until several revolutions later.

It is this erratic chronological variation of fuel feed to the cylinders that we blame largely for many of our difficulties in motor operation, gasoline getting past the pistons into the crank case, accumulation of carbon, and fouling plugs. It is also the reason for our present-day motors being very sensitive to every variation in ignition, because it seems that the more erratic the vapor content in the cylinder the more heat units are required in the spark to effect ignition.

Another condition which seems to assist the precipitation of the drops from the mixture is the change of direction of flow. In the multi-cylinder manifold, when the cylinders draw one after another in different directions,

at each suction stroke there is a certain reverse of flow along the manifold; and at this time the air will slow down and gain velocity in a reverse direction much more easily than the heavier gasoline drops. We believe it is largely for this reason that the difficulties of distribution increase with the number of cylinders.

I have made a few experiments with glass manifold sections to determine what velocities are necessary to keep a fairly well atomized mixture in suspension. These indicate that under a steady non-pulsating air flow a velocity of 38 ft. per second is necessary to keep the atomized drops off the

walls in a vertical rise of pipe. After passing around a bend or tee the requirements are more severe because the fuel has once been thrown on the walls by centrifugal force and must be wiped off again by the air velocity. We seem to find that to keep the intake manifold walls clean beyond a tee or fairly sharp bend requires a manifold velocity of about 75 ft. per second. Under conditions of pulsating flow, with suction strokes which do not overlap, as with motors of four cylinders or less, we have reason to believe that the critical velocities are somewhat less—say about 80 per cent of the values above given.

To simplify computation of air velocities we have prepared the curve shown in Figure 1. The mean manifold velocity for any given motor will depend upon the total displacement of the motor, the revolutions per minute, the volumetric efficiency, and upon the diameter of the intake passage. These curves have been made on a basis of 90 per cent volumetric efficiency, which is probably in excess of that obtained with any of our motors at their normal operating speeds. Having given the piston displacement of the motor, we multiply it by the desired

MOCK'S VISION

I BELIEVE and hope that the time is coming when the service departments of each responsible motor car and truck manufacturer will develop hot spot fittings and connections to replace the equipment of cars now in service. After the patterns and tools are once made, the cost of production is low and the application could probably be made in half a day, so that the complete installation should not cost over \$10 to \$15. I know of no other way in which an equal gain in operation, satisfaction and efficient service can be obtained for three to four times the price, and I am sure that the company which first undertakes this will be well rewarded for its effort.

number of revolutions per minute and use this value as an ordinate, from which the air velocities corresponding to different diameters of intake passages may be easily read off.

Our chief difficulty in manifold design comes because our motors must operate through a large range of speeds. If a car is designed to run at a maximum speed of 50 m.p.h. wide-open throttle and the intake manifold is designed for a velocity of 200 ft. per second at this speed, the velocity of 75 ft. per second will correspond to about 19 m.p.h., below which there will probably be some difficulty getting proper carburetion with a cold intake charge; and a velocity of 38 ft. per second will correspond to 9½ m.p.h., below which it will probably be very difficult indeed to get the motor to fire properly with a cold manifold and a moderately lean mixture. It is, of course, possible to increase the mixture vapor content, with a fuel containing a number of different elements, by increasing the rate of fuel feed, and thus increase the vaporization from the light elements fed.

I have heard of cars which were designed to operate with a cold manifold at one mile per hour wide-open throttle. On this basis, with the above manifold, the air velocity would be but 4 ft. per second, or 2⅓ m.p.h. An intake manifold with a velocity as low as this looks pretty sad. As you all know, a 2⅓ m.p.h. breeze can scarcely be felt; and I am quite sure the manifold walls would be covered with tears of grief because the gasoline could not get up to the cylinders.

It is possible to overcome the above difficulties to a large extent, and get a much larger operating range on a passenger car motor, by the proper application of heat, but I simply wish to emphasize the futility of trying to design a high-speed passenger car motor without giving careful attention to this application of heat. We can give motors large valves, lighter reciprocating parts, and efficient lubrication, but if we design the intake manifold large enough for high speed with no better heating means than a mere water jacket we will simply have a motor that will not operate during a great part of the time when a man would like to drive a car. We were able to make airplane motors operate throughout a range without heat on the manifold because of the good grade of fuel used and the nature of the propeller load, which, when the motor speeds are low, permits you to run at partial throttle and more favorable evaporating conditions; but the same design would be absolutely impossible in a passenger or commercial car with our present heavy fuels.

As previously stated, even distribution to the different cylinders of the liquid fuel content in the intake manifold is practically impossible at very low air speeds, while at extremely high speeds the fuel usually follows the air fairly closely. There is a large intermediate range, however, through which the fuel distribution is quite definitely affected by the design and contour or map of the intake system, and in this analysis it is necessary to make distinction between the effect of changes in contour and changes in area, which operate by changing the velocity.

My own experience has probably been the same as that of most engineers, that in addition to the things we can

understand about an intake manifold which affect distribution, there were a number of puzzling facts which we could scarcely account for at all; for one instance, the extraordinary effect that changing the order of firing may have upon the efficiency of any given manifold design, etc.

Some time ago we built a device by which we could blow a mixture of air and atomized water or gasoline through an intake manifold shape built in wood with one glass side. We also incorporated a hand or belt operated set of valves so that the successive impulses of suction could be reproduced. With this we gained an entirely new idea of the action of the intake manifold and found what seemed to be a satisfactory explanation for a number of the anomalies we had observed. I hope some time to have an opportunity of showing this machine in operation at a meeting of the Section, but will endeavor to describe its operation as clearly as I can.

The first thing we noticed was that, due to the long distance and number of bends between the main carburetor passage and any given valve pocket, when the suction to a pocket begins, after having previously been inactive, the fuel does not immediately begin to flow through the valve, and by the time the flow of fuel drops and mixture has been established the valve closes, while the fuel piles up near the valve pocket and stops. On the next suction stroke this fuel, left over from the pre-

ceding one, goes in and another charge is drawn over from the carburetor passage ready to go in the next time. In other words, it is entirely improbable that, at most operating speeds, any given liquid charge of fuel completes its journey from the carburetor nozzle to the cylinder during the same suction stroke that its air charge does.

We also seem to find that whenever the fuel and air mixture comes to a tee, or point where the passage divides—and when there is a flow in one direction while the other division is inactive because its intake valve is shut—as a result of the eddy at this point a little pool of fuel is formed in the passage which is inactive. Then when the intake valve of the previously inactive cylinder opens the sudden inrush of air draws in not only the fuel brought there by the previous air charge to this same cylinder but also the fuel deposited at the mouth of this individual passage by the suction of the neighboring cylinder. I think this is why we usually find that when the timing and design are such that two cylinders follow each other in drawing from the same valve pocket, the first one usually gets the richer mixture; of course, under the conditions of low velocity previously described. I would not say literally that the fuel drops down to the bottom of the manifold and forms a pool, because it does not always have time to do so; but it does stop moving, which gives, to a certain extent, a similar effect. A window in the intake manifold shows a rapid flicker of the atomized fuel, changing its direction back and fourth, even when the walls of the manifold are dry.

I would very much like to be able to evolve a few rules by which an efficient intake manifold design could be made. But the problem is so complicated, and the individual requirements of design are so varied, that this is practically impossible. The only definite recommendation I can make is that before proceeding with the actual

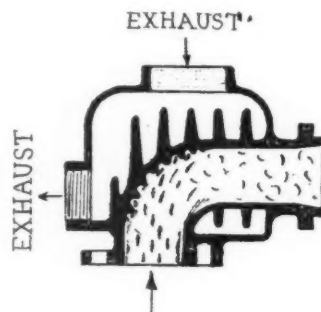


Fig. 2—Elbow heated by exhaust

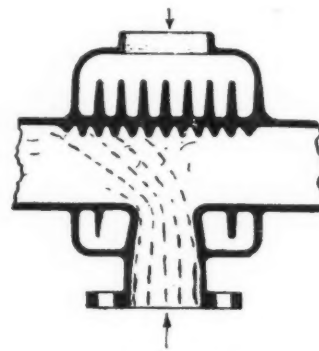


Fig. 3—Tee of intake manifold heated by exhaust

construction of any motor it would be well worth while to have a pattern-maker make up a wooden model of the contemplated manifold to scale and in the exact position that the finished manifold will occupy, and then discharge a mixture of air and water through it and notice the action, with the cylinder ports opening in the order of firing. A great deal can be learned about the distribution by turning on the air in spurts of a second at a time, with the valve ports open in succession. It will usually be found that there is a slight delay before any liquid fuel discharges from the ports, and the cylinders which will be getting the richest fuel charge will respond most quickly and in the greatest volume. A great deal can also be told about the flow of the fuel by the manner in which it comes out of the port, whether at one side, top or bottom, or evenly distributed through the air column.

There are a few points of design which seem to apply more or less universally and may be worthy of enumeration here. First, as above stated, no two valves should follow each other in the same pocket. The distance from a tee or point of division to each valve should be as nearly as possible the same. More important and less difficult to obtain, the angle of bend and amount of vertical rise should also be approximately the same. It is very bad to feed some cylinders out of the top of a manifold passage and others from a gradual rise at the ends.

Avoid any sudden enlargements, particularly in the vertical rise.

Most important of all, perhaps, is the application of heat, to be discussed more fully in later paragraphs.

The actual sizes will depend, of course, upon the intake velocities used, and the velocities that can be used are contingent upon the heating, as will be later explained. For the present-day motor-car motor, which is expected to operate on a range of full throttle of ten to one, I would make the intake manifold velocity not less than 250 ft. per second at the maximum normal operating speed, and I would try one with 300 ft. per second. If a properly designed hot spot is used, it may be practical to decrease this velocity to 190 or 200 ft. per second without any loss in efficiency at low-speed pulling.

One thing which I shall personally avoid is spiral bends or ramshorn shapes, not because some of them have not been known to work well, because they very definitely have, but rather because of the difficulty of knowing in advance how they are going to work. The effects of gravity and of centrifugal force may either oppose each other or combine, according to the speed. In several cases we have spoiled the action of the motor to an extent almost unbelievable by the use of an improperly shaped spiral bend, and in one case we remedied the trouble by an alteration so slight as to be hardly noticeable. In fact, it was a change which had to be shown more by model than by a drawing. Personally, I prefer to make the manifold nearly, if possible, in one plane, which permits a model to be made with one side in glass, and usually works out to a neat appearance when finished.

One point to be taken into account is the effect of having the throttle, if of the ordinary butterfly type, near a point of division. Care should be taken that the throt-

tle in a partly open position does not deflect too much of the liquid fuel stream into one part of the manifold. Unless the point of division or tee is plain in shape and well heated, the throttle ought to be at least 4 in. below the tee; it is even preferable to have the throttle crosswise of the tee, and we have nearly always had trouble when the tee bend has a deflecting corner in the center—what I might most easily describe as a Y bend.

Application of Heat

The proper application of heat is difficult under ordinarily accepted limitations, because of the great range in temperature variation in the many different conditions under which a motor is operated. All who have used a Moto-meter know the great variation in water temperature encountered on a single spring or fall day; and the heat of the exhaust at any given point can vary more than 500 per cent, between closed throttle running in winter and open throttle running in summer. With all

this variation in temperature we have the condition that a rise of 50 deg. Fahr. will cut down the density of our air charge (and the power) 10 per cent; and a rise of 30 deg. mixture temperature at low air velocities may make all the difference between perfect operation and continuous trouble. This sensitiveness to temperature change on the part of the fuel system, in conjunction with the very great temperature change encountered in the motor, is, I think, the reason why so little progress has been made in the application of heat to our fuel systems in the last few years.

The different ways of applying heat may be enumerated as follows:

- (1) Heating the fuel before it issues from the jet.
- (2) Heating the air charge.
- (3) Heating the intake manifold walls.

As to the first we definitely and positively advise against any attempt to heat the fuel in the float bowl of the carbureter, because of the fact that there are fuels in many sections of this country containing a small percentage of very volatile elements, casing-head gasolines being a sample. The amount of heat that is necessary in the carbureter to handle the heavier

elements will make these light elements boil rapidly in the jet, which totally upsets the metering of the carbureter, causes the motor to backfire and practically makes the car unusable, until the heat supply is removed.

Heating the air has the disadvantage that it applies equally or in greater measure to entering high manifold velocities, when it is scarcely needed, than to low air velocities, when it is most needed. This results in there being a considerable loss of power at high speeds, if the air supply is sufficiently heated to give good operation at low pulling speeds. Nevertheless, pre-heating the air to a certain degree is advantageous in all except hot summer weather, and I believe that the present practice of taking the intake air from a small heating chamber surrounding the exhaust pipe is about as effective as necessary and can scarcely be improved. It is, of course, necessary to provide a means for disconnecting the hot air by opening additional cold air vents in hot weather or in hot climates, also when using casing-head gasolines.

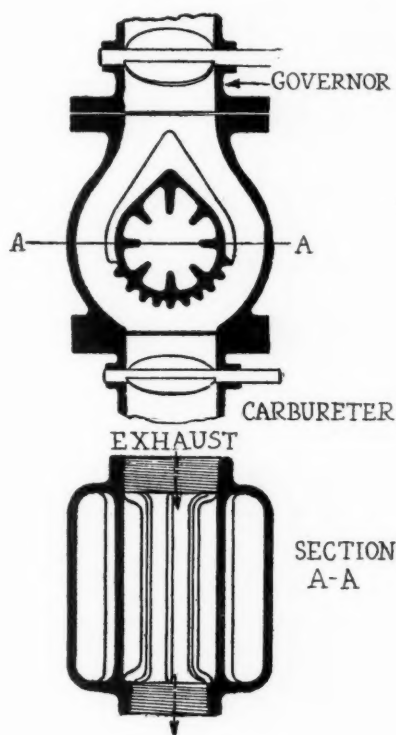


Fig. 4—Hot spot device for old truck engine

The third method mentioned, of heating the manifold walls, seems to me to offer the greatest possibilities, because it seems to work out in practice that the delivery of heat to the fuel is most efficient when the air velocities are low, just when this action is needed, while at high velocities the effect is less marked. This, however, is only true if the design is properly made, for there are several very important considerations which must be followed. The heat must be applied only on a relatively small area, and at points where the fuel gathers. It is well known that when the atomized mixture passes around a bend or through a tee the heavy particles will go to the outside; also after the fuel is once condensed that it tends to follow the laws of gravity and seek the bottom of the passage. This, of course, means that the vertical rise above the carburetor, the outside of the bend or tee and possibly a small portion of the bottom of the passage just beyond the bend, are the places to heat. If these walls are heated to a temperature of 250° or higher the fuel particles will strike them and fly off or fry off as a fine fog or smoke and remain in this condition until the mixture reaches the cylinder. In order that this temperature may be quickly attained after starting, and in cold weather, it is necessary to take a considerable portion of the exhaust heat, and this we have obtained by heavy ribs projecting into the exhaust passage, and making sure in all cases that the exhaust circulates through these ribs. To keep from getting too much heat in the summer time under full load with this effective method of heating, it is absolutely necessary as above stated that the heating area be confined to only the places above enumerated where the heavy fuel particles strike. In order to hold the fuel at this point longer, and insure a more complete heating at low temperatures, ribs or baffles are provided to obstruct the flying off of the particles.

Fig. 2 shows an elbow heated by this method. The carburetor is attached at the bottom and the mixture is delivered horizontally to the intake manifold at the right, while the exhaust comes in at the top and escapes at the left.

Fig. 3 shows the same construction applied to the tee of the intake manifold. The exhaust enters from the top and escapes through an outlet to the rear—not shown. In both these cases it is advisable to make the exhaust connection as short and direct as possible, and the larger the size the better. However, the exhaust outlet can be small, 3/4-in. iron pipe being easily adequate in size. With this size pipe, due perhaps to the cooling effect and baffling effect of the ribs, the sound of exhaust escaping through this passage is scarcely noticeable.

Fig. 4 shows an attachment that is badly needed on a great many of the present-day motor trucks. In order to obtain a good governor location, along with gravity feed to the carburetor, the carburetor is frequently mounted very low with a cold vertical rise of intake passage a foot or more long, which acts as a natural condensing chamber for the fuel. This illustration shows a heating element, to be located between the governor and the carburetor, in which the exhaust is passed through a central cross tube over which the intake charge must pass and upon which the gasoline particles will strike. The axis of the throttle should be crosswise to the direction of the tubular passage, as shown, so that at partial throttle openings the fuel will be sure to strike the heated surface.

A very important point about the installation of such a device is that the exhaust must actually reach the "hot spot." If the piping from the exhaust manifold to this point is a foot or more in length, the natural resistance

of the line will be high in proportion to the main exhaust pipe and very little exhaust will pass through it, with the result that it will not heat up with closed throttle operation, but only after the engine has been pulling hard. Therefore, when the pipe to the hot spot is necessarily long it should be made as large as possible, 1 1/2 to 2 in. diameter, and protected from loss of heat either by wrapping the outside with asbestos or by putting an additional outer sheet metal or flexible tubing casing around the outside. It will probably be found necessary also to restrict the main exhaust line by a bushing or flat plate with a hole in it, to about the same size, 1 1/2 or 2-in. outlet, so that at least half of the exhaust will pass to the hot spot. It is remarkable how *very little heat* will pass through a long pipe connected into the exhaust manifold, unless some additional restriction is placed beyond this connection in the exhaust line. Inasmuch as the average exhaust line could be reduced to one-fourth of its area without either affecting the power or overheating the motor, it is perfectly safe to make the above restriction in the main exhaust outlet.

The use of the above devices has made an extraordinary improvement in the operation of a number of cars upon which we have been able to try them. We have been able to make six cylinder motors warm up very quickly in the coldest weather. As the hot spot is so limited in area it does not heat the intake charge more than 20 to 30 deg. Fahr. and we have had actually a gain in power rather than a loss, probably because of better distribution and also the fact that it was possible to use lower manifold velocities, with less reduction of volumetric efficiency. The fuel economy is very much better, indeed, both because the carburetor may be adjusted much leaner, and because the dash control of the mixture is used so little. Another reason why the economy is better is because the motor remains in better shape: there is less carbon deposit: there is almost no spark plug or ignition trouble; and it is no longer necessary to change the lubricating oil every two or three weeks. I firmly believe that three-fourths of the service work performed on passenger cars and motor trucks to-day would be eliminated if their intake system would be modified along the above lines.

I believe and hope that the time is coming when the service departments of each responsible motor car and motor truck manufacturer will develop fittings and connections of this nature to replace the equipment of cars now in service. After the patterns and tools are once made the cost of production is low and the application could probably be made in half a day, so that the complete installation should not cost over ten or fifteen dollars. I know of no other way in which an equal gain in operation, satisfaction and efficient service can be obtained for three to four times the price, and I am sure that the company which first undertakes this will be well rewarded for its effort.

There is one serious difficulty often encountered in the application of a hot spot to present cars, and that is in the difficulty of piping exhaust heat across a motor, when the carburetor and exhaust manifold are on opposite sides. In order to make the exhaust pass through this branch it is necessary that the branch should be almost as large in capacity as the main exhaust line, which leads to expense, also difficulties in silencing. We are making experiments as to the amount of restriction that can be placed upon the exhaust line in order to force heat across a motor in this way, but at the present time I can only say that in every case where it is possible to do so the carburetor should be placed on the same side of the motor as the exhaust manifold.

Electrical Heat Treatment of Steel

HERE is an engineering story with a touch of romance—Steel tubing was needed during the war for the shafts of Cossack cavalry lances—Necessity again was the mother of invention and despite the fact that desired material was not at hand, the Cossacks were equipped with lances and now many other industries will profit.

By H. P. MacDonald*

THE process which will be described was developed at the plant of the Snead & Co. Iron Works as the result of a search for a method to heat treat the steel tubing which formed the shafts of Cossack cavalry lances. It was necessary to use a 0.35 per cent carbon, soft welded steel tube 1 in. in diameter, 20 gage, as cold-drawn tubing was unobtainable. A high degree of stiffness was necessitated by the tests to which the finished work was submitted, requiring an elastic limit of over 83,000 lb. per sq. in. Various ways of heat treating this tubing in ordinary types of furnace were tried, but owing to the length, 10½ ft., and the extreme lightness, it was found impossible to handle it in other than a vertical position, and any fuel-fired vertical furnace was liable to great variation in temperature between the top and bottom.

A plan was then formed for employing an electric current of low voltage and high amperage to heat the tubing by its own internal resistance, and an apparatus was designed to accomplish this. The tube was held in a vertical position between copper contacts, which gripped it at its upper and lower ends, the upper contacts being fixed vertically and the lower ones free to move up and down with the tubing, the latter being brought to the same initial position for the start of each operation by a treadle and positive stop. The contacts were gripped by powerful springs and opened by cams attached to a vertical shaft. The current was led from a low-voltage transformer to the upper and lower contacts, and the tube heated by its passage, in about 20 sec. On reaching the required temperature the contacts were opened and the tube allowed to fall vertically into a deep bath of oil situated directly underneath the machine. This process proved very successful.

No attempt was made to measure temperatures accurately, the elongation for a given temperature being figured out and the electric current shut off by a mechanically operated switch which was tripped when the desired elongation was reached. It was observed, however, that the temperatures necessary for hardness were much lower than those required when a fuel-heated furnace was used, and in an endeavor to learn the cause for this I met Prof. James S. Macgregor of Columbia University, New York City, who was looking for means to heat treat a lot of aircraft tubing for the Italian Royal Flying Corps. As a result, a large quantity of tubing of various diameters, in lengths up to 22 ft., was heat treated satisfactorily, no difficulty being experienced in keeping the tubing straight, and the process taking place so rapidly that the tube was not scaled. During this time the apparatus was being gradually improved, and it was discovered that when the critical point of the ma-

terial was reached the tubing, instead of continuing to expand, actually shortened in length, thereby indicating in itself the critical temperature, and means were devised for multiplying the movement and indicating the temperature on a dial.

Later on, further improvements were made, such as hanging the upper contacts to cables passing over pulleys at the top of the machine, connecting these cables with a drum at the bottom, and having the latter connected through helical gearing so as to change the point of leverage on the temperature indicating pointer in such a way as to make the movement of the pointer constant for all lengths of material undergoing the same temperature change.

About this time work was also done for the Bureau of Standards, which was developing wing beam structures for all-steel airplanes, and tests on samples cut from a chrome vanadium steel beam of about 0.25 per cent carbon and 0.018 in. thick showed the following results:

Proportional limit, lb. per sq. in.	112,000
Ultimate strength, lb. per sq. in.	218,000
Elongation in 2 in., per cent	2.7
Scleroscope hardness	No. 75

These beams could be cut with a hacksaw after heat treatment.

A large quantity of steel tubing for use in landing chassis of Handley-Page airplanes was also put through this process with complete satisfaction to the Government inspectors, who required an ultimate strength of 110,000 lb. and an elongation of 15 per cent in 2 in.

Samples of 3½ per cent nickel steel axles submitted to the Dayton-Wright Airplane Co., and tested in its laboratory, gave the following results at different temperatures:

Elastic Limit, lb. per sq. in.	Ultimate Strength, lb. per sq. in.	Elongation in 2 in., per cent
154,000	172,400	6.5
198,600	223,500	6.0
220,500	246,000	6.5

When the war ended we were working with the engineering division of the Air Service conducting tests on round steel tubes to be used as interplane struts, and tests developed the interesting fact that the ordinary column formula failed to hold in steel of such high tensile strength. In the case of a tube having an ultimate strength of 193,000 lb., the compression results were 12 per cent higher than the strength computed by the formula, which checked out very closely on ordinary materials. The process is now being used for heat treating thin wall tubing for propeller shafts for trucks and passenger cars.

In the machine as it is now used, the work is held in copper contacts operated by compressed-air cylinders,

*Paper read at the Summer meeting of the S. A. E. condensed.

and the temperature is indicated on the dial at the left, the pipe containing the quenching oil being shown projecting above the floor of the shop. The present type of machine allows the critical temperature of the material being treated to be determined readily while the work is in process, especially in the case of high carbon or alloy steels, in which there is a very definite retrograde movement of the pointer when the calescent states of the material are reached. It has been found that these critical periods occur under electric treatment at very much lower temperatures, that is, from 50 to 100 deg. Fahr., than when the ordinary furnace treatment is used. It is not, however, necessary in the use of these machines to know beforehand the critical temperature, as it is automatically determined in the process.

The advantages of this method seem to lie in the low temperatures necessary, speed of the heating operation which is usually a matter of less than 1 min., thereby in most cases completely obviating the formation of scale and making possible the heat treatment of extremely light material, the complete control of the work, and the high physical characteristics obtained, the reduction in

workings of ten rods of steel of the following average analysis: Nickel, 3.45 per cent, and carbon 0.36 per cent. It is interesting to note how much more rapidly the temperature increments occur at the early part of the heating than at the higher temperatures. Of course, this is partially due to radiation, but to a greater extent to the increase in resistance and the consequent drop in current density, the heating value being as the square of the current passing through the specimen.

The second curve shown dotted in this chart represents the workings of the steel preparatory to the second quench. It will be observed that the critical period occurs at a considerably lower temperature on the second quench.

Chart No. 2 for the same steel has for its ordinates the voltage across the contacts gripping the specimen, the amperage passing through the specimen, the watts generated and time elapsed in seconds, the abscissæ again being temperatures.

Previous experiments showed that where the material was quenched before the pointer showed the temperature beginning to increase again, the results were uncertain,

and to obtain proper quenching conditions the old idea of "quenching on a rising temperature" had to be followed. The tests show that after the needle has once begun to indicate an increase in temperature after the drop at the critical point, practically the same results are obtained until the maximum temperature, reached before entering the critical period, is passed. After this there is a tendency for the grain of the steel to coarsen. These tests also indicate that a single quench or nickel steel heated electrically gives as good results as the double.

An interesting feature to be gathered from chart No. 2 is the amount of energy necessary to be put into the steel to accomplish the internal work required to take it through the critical period. Calculations show that the specimens treated each took 204 B.t.u. per lb. to carry them through the entire heating range, 142 B.t.u. per lb. being required to bring them up to the critical temperature and 62 to carry them through the critical period.

The importance of completing the allotropic changes

area of the test pieces being particularly noteworthy. The process is also useful for discovering flaws or thin spots in the material undergoing treatment, this being particularly applicable to tubing, where any irregularity in the wall is shown by that part overheating or heating more quickly than the other portions of the tube. Three volts per foot of length of the material to be heat treated are found ample for any analysis, and a current density of 8000 amp. per sq. in. in cross-section is usually employed at the start of the process. The voltage between contacts increases as the temperature of the material goes up and the amperage correspondingly falls, the figures given being for the amperage taken at the first rush of current. In general practice for tubing, 0.1 kw.-hr. per pound of material heated up through its critical state is required. Solid bar stock takes about 0.06 kw.-hr. per lb.

Chart No. 1 shows the average

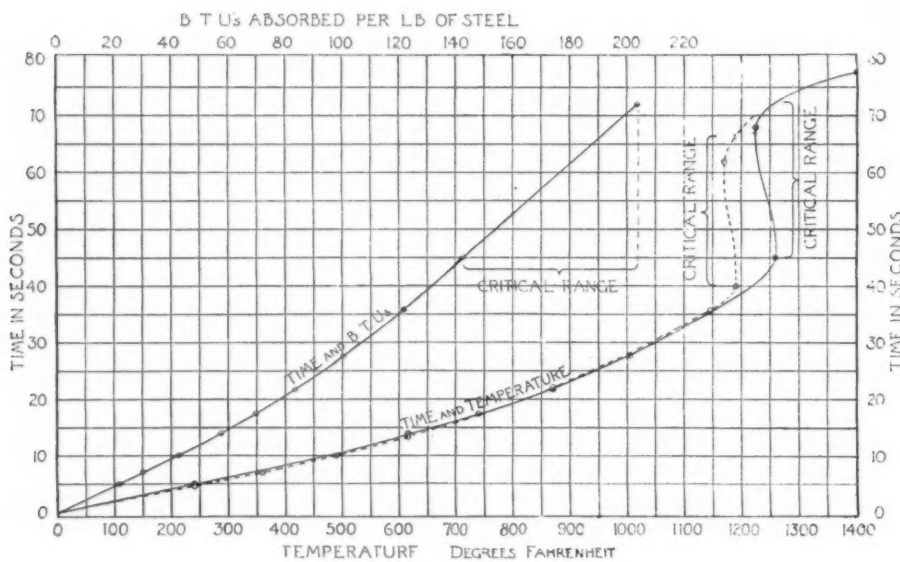


Chart No. 1

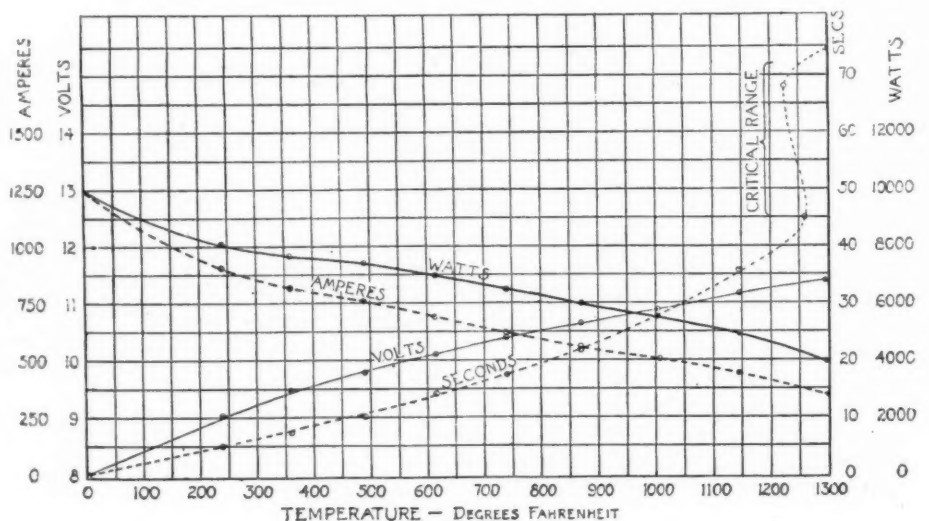


Chart No. 2

in the structure of the steel taking place in the critical period is too well known to be more than mentioned here, and these figures illustrate the amount of internal work that must be accomplished, neglecting the factor of radiation. In other words, 30 per cent of the total heat units necessary to put into this steel go into it after it has reached its maximum temperature and is passing through the critical period and before the temperature again begins to rise. Additional investigations are desirable along these lines, particularly with chrome-nickel and carbon steels.

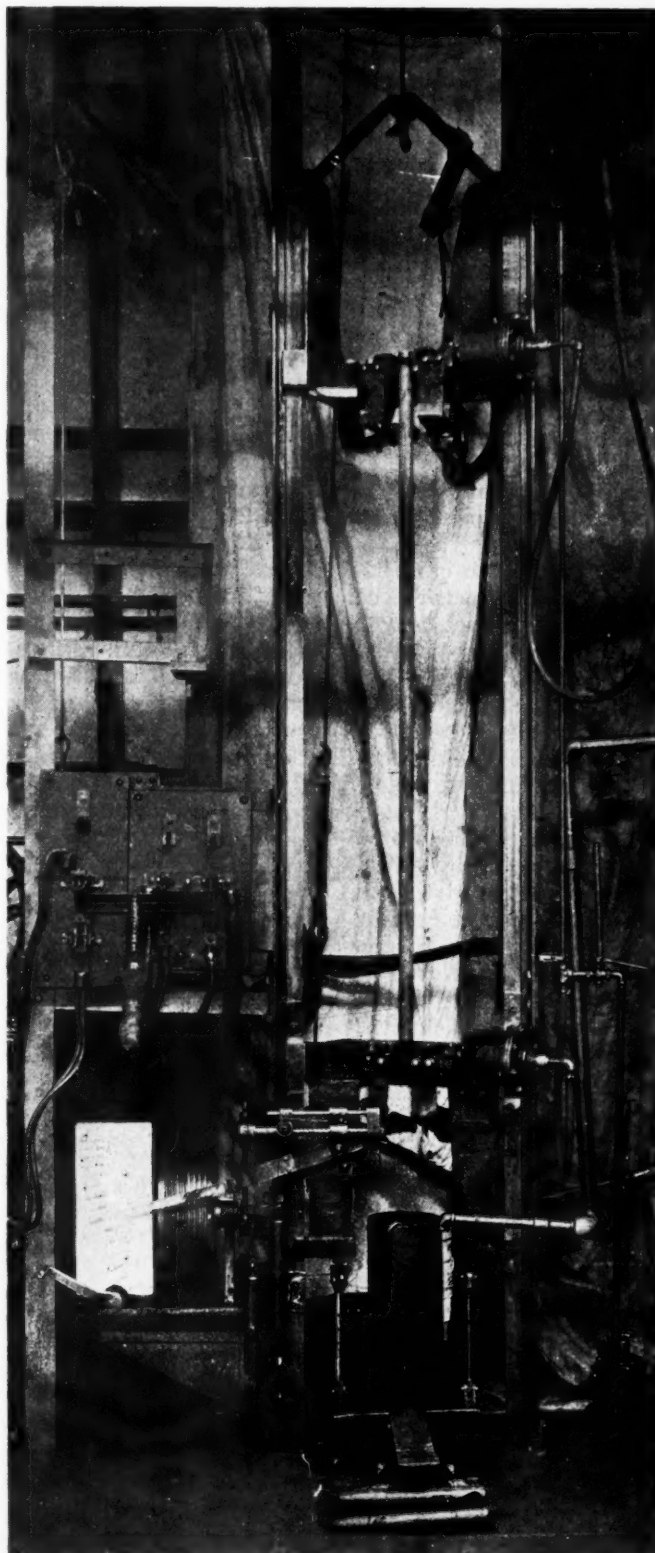
The calibration of the machine was accomplished in the following manner: For the lower temperature lead, tin and zinc were fused on the work and the temperature run up until these materials were successively melted and then allowed to freeze slowly, and the reading on the dial noted. For higher temperatures, and as a further check, the leads of a platinum-iridium pyrometer couple were placed inside of a heavy wall tube and pyrometer and dial readings taken simultaneously, the temperature of the tube being held constant at various stages by switching the current on and off.

The cost of handling work by this method is primarily determined by that of electric current available. Where the cost of the latter is low, even heavy sections, such as rails and structural members, can be heat treated to advantage, and a resulting improvement in strength and reliability obtained. For instance, in a 0.70 per cent carbon-steel rail it would be easy to obtain a tensile strength of 130,000 lb., combined with greater reliability than now obtains in the ordinary rolled section. Up to now we have only used oil as a quenching medium, and naturally it forms a considerable part of the cost of doing the work.

Low-grade steels could be quenched in water. The entire absence of replacement of refractories, and the avoidance of the use of pyrometers, together with the readiness with which operators can be taught to do the work by this process, increases its advantages.

As yet, we have only attempted to heat treat pieces of uniform section, but have some hopes of being able to handle pieces of varying section such as axle spindles, but can give no definite data on this at the present time.

We realize that the field for the process has only been scratched.



A special machine developed for heat treating steel tubing electrically

Thread Milling

THREAD milling machines are said to have been in use in this country as far back as Civil War days. The growth of the automotive industry helped to perfect thread milling and make it better known, but it was really the European war which gave a big impetus to the process.

This description of a single purpose thread miller is from a circular of the Smalley-General Co., Inc., and gives a good idea of the general features of the simplest type of thread milling machine.

The bed is of the lathe type, and the main head is cast solid with it. The main head spindle is hollow, and its dimensions in a medium sized machine are 38 in. in length by 6-in. bore. Chucks for holding the work are bolted to the flange of the main spindle, and any type of chuck can be used.

Located on the ways of the machine is the bottom slide, which in turn carries the top or cross slide. This cross slide is controlled in relation to the bottom slide by means of a micrometer screw, by which the diameter of the thread is determined. The top slide carries the milling spindle, and the milling hob is held on this spindle by means of a tapered arbor and a draw-in bolt.

When a multiple tooth hob is used, the thread is completed in one revolution of the work, but when a single cutter is used, as many revolutions are necessary as there are threads.

During the milling operation, while the work held in the chuck makes one revolution, the milling head is moved back on the ways, by the lead screw, a distance equal to the pitch of the thread to be milled.

All kinds of threads, except those absolutely square, can be milled.

Automatic Temperature Control

An Instrument Applicable to Both Gas and Electric Furnaces
—Regulates Temperature to Within 1% of Total Scale Range

IN the heat treatment of steel and in other industrial processes requiring accurate maintenance of furnace temperature, it is customary to use indicating or recording pyrometers, by the indications of which the temperature is controlled manually by the furnace tender. This introduces a personal equation in the results which it is always best to eliminate if possible.

Attempts have been made in the past to electrically operate switches and valves by permitting the pointer of the pyrometer to come in contact with adjustable contact arms on each side of it. Unfortunately, the millivoltmeter used with the thermo-electric pyrometer has an exceedingly weak control for the pointer. This is shown by the fact that it is quite possible to blow the pointer across the scale with the breath.

Consequently, it is not sufficiently positive to be satisfactory for automatic control work to simply permit the pointer of such a pyrometer to move into contact.

An automatic control pyrometer has been developed by the Brown Instrument Co. of Philadelphia, which works on a different principle. A thermo-couple formed of a nickel-chromium alloy is installed in the electric furnace the temperature of which is to be controlled. The thermo-couple actuates a high resistance millivoltmeter. Below the pointer, and adjustable throughout the whole scale range, is a table carrying two contact pieces, separated by a thin piece of insulating material 1/32 in. thick. The depressor arm driven by a small electric motor, or by a clock if preferred, depresses the pointer at regular intervals, usually every 10 sec., and in doing so the pointer forces together the two contact pieces below.

Now let us assume that the pyrometer controller is required to control the furnace at a temperature of exactly 1400 deg. Fahr. The knob on the left of the instrument is turned until the index in front of the scale stands at 1400 deg. Fahr. This index corresponds to the position of the thin insulating material which separates the high and low contact.

The switch connecting the furnace in the line is closed and the pointer slowly rises across the scale as the temperature of the furnace increases. As the switch is

already closed, when the pointer is depressed on the low contact the switch continues to remain closed, and no change occurs until the pointer passes over the neutral insulating piece, and is depressed on the high contact. The switch indirectly operated by a solenoid and relay is now instantly actuated and the circuit opened. The temperature of the furnace begins to fall slowly, and when the pointer is again depressed on the low contact, the circuit is again closed. This operation continues as long as the furnace is to be operated.

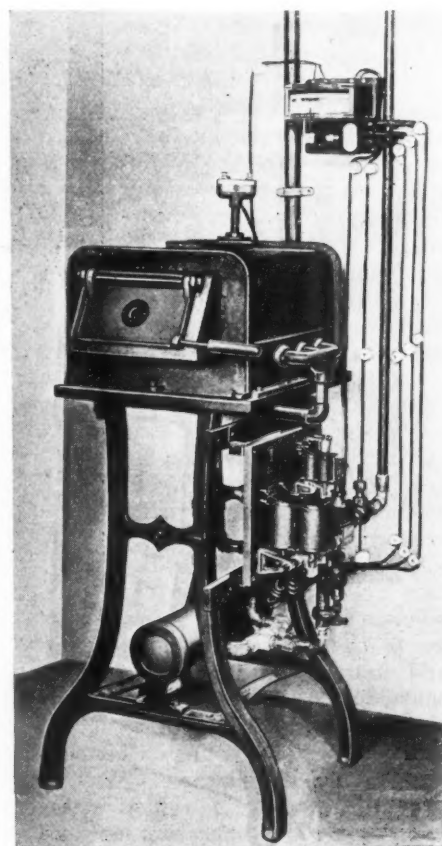
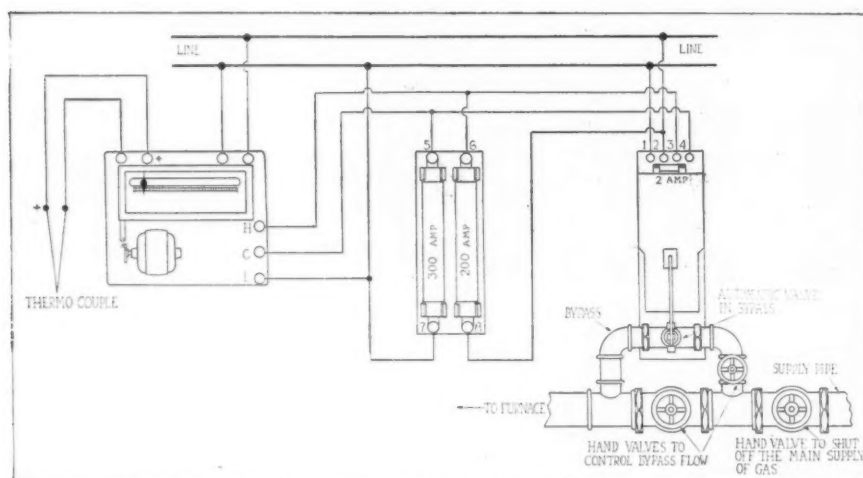
When the switch opens and closes the main circuit, the current in consequence is either full on or off, and the fluctuations are continuous within narrow limits of some 10 to 20 deg. Fahr. These continuous risings and fallings of temperature can be largely reduced, and closer control can be procured by the use of two rheostats in the furnace line. The solenoid operated automatic switch is then used to simply cut in and out of circuit the second rheostat.

Assuming it to be desirable to continually maintain 1400 deg. Fahr. in the electric furnace, irrespective of fluctuations of voltage, the two rheostats are set so that with only one rheostat in the circuit the temperature will rise to approximately 1500 deg. Fahr. With the second rheostat in the circuit, the temperature drops to 1300 deg. Fahr.

When we now use the solenoid-operated switch to cut

Gas oven furnace with Brown automatic temperature control instrument and solenoid operated relay and valve

Diagram of connections for Brown furnace temperature control system



in and out the second rheostat, we naturally control the temperature only between 1300 deg. and 1500 deg. Fahr., and we do not have the rapid surges or ups and downs in temperature, hence maximum control is secured.

The same form of switch can be used to operate a valve to control the gas or oil furnace. It has been found desirable to use an automatic valve in a by-pass so as to simply control a portion of the gas or oil supply, and in the same manner as in the electric furnace control eliminate the maximum fluctuations caused by the complete opening and closing of the switch or valve. If there is a 2-in. supply pipe for the gas to the furnace, it is customary to by-pass this and use a 1/2-in. automatic valve, which gives approximately 25 per cent control. This is said to be sufficient to control the usual fluctuations in gas supply and to secure very satisfactory control. This method also eliminates the difficulty which would occur

where the gas is completely shut off and then turned on in full, as would occur without the by-pass control.

For low temperatures, up to 800 deg. Fahr., the Brown Instrument Co. uses a thermometer as the actuating device. For temperatures up to 2000 deg. or 3000 deg. Fahr. a pyrometer and base metal or platinum thermocouple is used.

The accompanying diagram shows the hand valves which regulate the amount of gas fed through the main line and through the relay. It also shows the automatic valve and the connections to the instrument. The current flowing through the contact is only 1/10 ampere, which indirectly operates the switch closing the valve. This control is accurate within 1 per cent of the total scale range or at 1000 deg. Fahr., 5 deg. plus or minus. This instrument can operate continuously for 24 hours a day, if desired.

Characteristics of a High-Grade Aero Engine

By J. H. W. Kerston, M.E.

THE phenomenal performance of the original Mercedes aircraft engine in establishing a world's record for duration, of continuous flight of 24 hr. 20 min., in 1913, has never been equaled even now after six years' benefit of concentrated war activities the world over, with literally unlimited funds and resources back of it, to develop its scientific research from every conceivable angle.

Then, again, the very same type of engine, with four cylinders instead of six, as used on the aeronautical model, took first, second and third honors in the French Grand Prix in July, 1914, the last important international road event before the war, against the crack drivers and the last word of the engineering genius of the world. This performance was all the more remarkable because the Daimler Motor Co. had retired from the racing field six years previously and had been resting on its laurels achieved in the earlier days.

The all-steel type of engine has been more than successfully demonstrated abroad, and if we can obtain such phenomenal results from well designed four and six-cylinder engines, why resort to a greater number of cylinders, merely multiplying and adding complications?

There is indeed a very large field for the American designer, to go ahead on his own initiative and produce an engine which will not only be more efficient and economical, but also cheaper to manufacture per shaft horsepower and more reliable than the old engine, and less complicated.

Summarizing reports on engine performances both here and abroad, we find the following: Although some of the French, British and American engines show a slightly better horsepower-weight ratio, the factor of safety and reliability of the Mercedes type engine has never been approached. Statements to this effect have been made by some of the leading authorities, British and French, and it is also shown in an official French report, an abstract of which was reprinted in a recent issue of *La Vie Automobile*.

It has also been found and proved by actual tests that of two airplane fuselages, equipped with a Vee engine and a six in line respectively, the latter will not only outlast the former, due to less vibration from the six, but the amount of parasite resistance is also greatly reduced in the latter.

The author can also state on good authority that a number of giant planes are about to be built in this country by a practical aviator and airplane constructor, a man who in 1911 (8 years ago) actually lifted and flew with 14 passengers in his plane in Europe. This giant plane will have accommodations for 32 passengers, and will be completely equipped with all Pullman conveniences, including baths, kitchen, etc. This plane will be equipped with four six-cylinder Mercedes

type engines of approximately 400 hp. each. The mechanical details of the engine will be identical with those of the engine described in *AUTOMOTIVE INDUSTRIES* of March 6, 1919, except that it will be larger throughout and carry six cylinders instead of four. The camshaft will also be provided with a compression release in order to facilitate starting.

The writer wishes to point out that the old idea that one type of engine cannot be made to serve both aeronautical and automobile purposes has been disproved sufficiently by the Mercedes Grand Prix 1914 engine, which is an aeronautical engine in every sense of the word, merely adapted to turn over as high as 3800 to 4000 r.p.m.

The next few years—in fact, the next few months—will undoubtedly bring phenomenal results in better airplane performance, made possible by the better performance of airplane engines with which these planes will be equipped. We will find that aero engines, instead of averaging 2 lb. per brake-horsepower, will possibly average from 3 to 3.6 lb. per brake-horsepower, but in thus increasing the weight, greater reliability and steadier performance will be obtained, which in turn will enable the engine to turn over for 50 or 100 hr. without any perceptible loss of power, due to carburetion, ignition or lubrication troubles, or merely due to mechanical defects, such as actual fracture of engine parts.

Effect of Wrapping on the Strength of Airplane Struts

THE practice of wrapping airplane struts or wing beams with canvas developed under the supposition that such wrapping increased the strength of the members at critical points, prevented sudden failures and kept out moisture. Wrapping has been advocated especially for cross-grained material in order to make available for airplane construction stock which would otherwise be rejected.

Extensive tests have been made at the Forest Products Laboratory for the United States Air Service to determine the reinforcing value of such wrapping. These tests were made upon cross-grained struts of Sitka spruce and Douglas fir partly or entirely covered with Bakelized canvas or the standard cotton tape, and upon some of the same struts with the wrapping removed.

The conclusions reached from the tests were as follows:

The addition of Bakelized canvas to cross-grained struts increases the load somewhat, but decreases the load per unit weight; it also increases the deflection and work to final failure and hence the shock-resisting capacity of the struts.

How the NC Boats Were Built Under Pressure of War Need

This is a continuation of the official story of the building of the NC boats, the first aircraft to cross the Atlantic. Last week Commander Hunsaker told how they were designed. This week he tells how they were built, of the industrial discoveries and conventions that made them safe and serviceable and of the building of the giant testing hangars. Next week he will tell of the flight.

Part II

By Commander J. C. Hunsaker*

THE metal fittings where struts and wires are fastened to the wings presented a serious problem. The forces to be taken care of were so large that it was necessary to abandon the usual methods of the airplane builder and adopt those of the bridge designer. All forces acting at a joint pass through a common center. In this case, as in a pin bridge, the forces are all applied to a large hollow bolt at the center of the wing beam. In the design of the metal fittings to reduce the amount of metal needed, it was decided to employ a special alloy steel of 150,000 lb. per sq. in. tensile strength. To increase bearing areas, bolts and pins are made of large diameter but hollow.

Guarding Against Corrosion

The steel work being highly stressed, it is especially necessary to protect it against salt water corrosion. The development of the present Navy standard practice may be of interest at this place. At the start of the war aircraft fittings were copper plated and in some instances the copper plating was covered by nickel plating. If the plating became scratched or abraded, moisture and air were admitted and very rapid corrosion would ensue, the iron being electro-positive to the copper or nickel and thus forming a primary battery.

Recognizing the fact that zinc is a metal that is strongly electro-positive to iron, the Bureau decided to eliminate copper and nickel plating and to use in place thereof galvanized coatings produced either by the hot dip, electro-galvanizing or sherardizing processes. Metal thus treated, even when abraded, is protected from corrosion because of the strong electro-positive nature of the zinc, which has a high protective influence upon any adjacent areas of steel that may be uncoated or abraded. Since the hot dip process operates at a high temperature, approximately 375 to 475 deg. cent., it might injuriously affect certain types of heat-treated steel alloys and the electro-galvanizing method is used wherever possible and is required for all alloy steels. Through the assistance of the Bureau of Standards a plating expert was obtained and sent to the different factories to install this process. After the parts are galvanized they are then coated with naval gray enamel, which is either air dried

or baked on. It has been found that the enamel adheres well over the electro-galvanized part and a fitting is obtained which has given excellent results on exposure to salt water for a long period of time. This is considered a development of great importance since so much trouble has heretofore been had with improperly coated metal fittings.

Aluminum is used to a considerable extent in the construction of aircraft instruments, and it has been found that rather rapid corrosion of the aluminum may ensue when exposed along the seacoast. For this reason aluminum instruments have been coated usually with spar varnish or naval gray enamel. The results obtained have been very good, and it is probable that coatings of this type will be used in the construction of certain parts of the aluminum strength members of rigid airships. The Bureau has under way a series of exposure tests at different points along the coast to determine the resistance of various aluminum alloy sheets to corrosion. There has been recently developed in this country at the request of this Bureau aluminum alloys which are of themselves highly resistant to atmospheric influences regardless of any coatings.

Various types of soldering flux and paste have been used in different aircraft contractors' plants. The largest use of these has been in the soldering of splice terminals on wire cables. It has been found that whenever certain of these soldering compounds are used, rapid corrosion of the cable occurs, as the compounds contain acid ingredients which work down into the strands. Examination of a great many samples of different types of soldering compound show in practically every instance a very large proportion, from 20 to 80 per cent, of zinc chloride, sometimes admixed with ammonium chloride or mineral oil. The purpose of the zinc chloride is to have present a material that would hydrolize to an acid reaction which would cleanse the surface of the metal by dissolving the oxides and make a good soldering surface.

It has been found that the use of such compounds can be done away with entirely and one cause of corrosion eliminated by the use of a soldering flux free from mineral acid. The flux consists of rosin with an organic acid compound such as stearic acid, these two ingredients being melted together in equal quantities by weight. This material has practically no solvent effect upon

*Bureau of Construction and Repair, Navy Department. Paper presented at the Summer Meeting of the S. A. E.

metal, but cleanses the surface sufficiently from the oxide to present a good soldering joint. Some slight difficulties were at first had with contractors who endeavored to make up their own soldering compound to the above formula, reports being to the effect that they did not get sufficient cutting effect with the compound. These instances, however, showed that they had purchased stearine in place of stearic acid. Stearine, as is well known, is a glycerine ester of stearic acid and has no acid value, being neutral. Stearic acid, on the other hand, has a high acid value of 200, and when used with rosin forms a soldering flux that gives very satisfactory results.

Protecting Wood and Fabric

Besides protecting the metal parts, it is necessary to protect the wooden members and their glue joints. Ordinary paint is fairly satisfactory but too heavy. The common varnishes and shellacs are not watertight enough. Through the early efforts of the Bureau co-operative work was done to develop a type of spar varnish that would give satisfactory results upon hulls, wooden parts and wing surfaces of Naval aircraft. After this varnish had been developed and specifications issued, manufacturers soon learned the method of producing it, and within a short period of time it was found on the market in great quantities and at a reasonable price. The base of the varnish is tung oil. This varnish has been found highly resistant to water and has been used with most satisfactory results. At the same time, there was developed a naval gray anti-actinic enamel, using as its base the same varnish previously referred to ground with certain pigments to produce the desired color and light stopping property.

The protection of the fabric wing covering becomes of added importance on the NC boats on account of the great area involved and the expense and difficulty of renewal. At one time wings had to be recovered very frequently, but with the present Navy standard doping practice the fabric stands up under favorable conditions from 6 months to a year.

To cover the NC surfaces about 6000 sq. ft. of fabric has to be treated, requiring over 200 gal. of dope. There are two types of dope in use at present by the Navy Department. These are known as a cellulose nitrate and cellulose acetate dopes. The latter is produced from cotton treated with acetic anhydride and acetic acid, while the other is made in a manner similar to the production of gun cotton through the use of cotton treated with nitric and sulphuric acids. The acetyl or the nitrate group is taken up by the cellulose to make a new compound which is soluble in certain solvents. The treated cotton is then dissolved in solvents such as methyl, amyl, propyl, butyl or ethyl alcohol, acetone, etc., subsequently adding other non-solvent thinners such as benzol, alcohol or benzene. Different kinds of softeners and fire-resisting salts are then added to the dopes. These are usually high-boiling, slow-evaporating liquids. Diacetone alcohol is a representative of this class. Triphenyl phosphate is used for its fireproofing value. A small quantity of urea is sometimes used to prevent the acidity.

The present Navy practice in doping fabric is to apply first two coats of acetate dope because of its higher fire-resisting value and because of the fact that the acetyl radical present is ordinarily not injurious to fabric. There is then applied three coats of cellulose nitrate dope. A very taut surface is obtained. Naval gray enamel is then applied in one or two coats according to the wing surface to be treated. With this practice no difficulty has been experienced with scaling or cracking of the wing enamel. On the other hand, when five straight coats of acetate dope are used very serious scaling and cracking of the subsequently applied enamel will take place. The cellulose nitrate dope, moreover, is very much cheaper than the acetate dope, is readily available, has greater covering properties and gives greater tautness to the fabric.

The use of the wing enamel referred to has been a curious development which dates back to the examination of rudders on some planes that were in use in Florida several years ago. The fabric was found to be rotted in several places but in perfect condition where covered with the naval aircraft insignia paint. This indicated the value of the paint in shutting out the actinic rays of

the sun. From that time on the Navy has used an anti-actinic wing enamel.

Extensive tests have been made by the Bureau on the use of so-called fireproof dopes, which consist usually of cellulose nitrate in which there have been distributed fireproofing ingredients, such as di-ammonium phosphate, calcium, magnesium and zinc chlorides and also tricresyl phosphate in various combinations. Good results were obtained with di-ammonium phosphate.

New types of dope have appeared in recent years under the name of pigmented dopes, first used by the British. These consist usually of highly plasticized nitrate dope in which pigments and softening materials are distributed and are used in place of varnish. The wearing value and fire-resisting properties, however, are not as high as the naval gray enamel now in use by us.

Considerable work has been done by representatives of the Bureau in factory control of conditions at contractors' plants. This work covered the heating arrangements, removal of evaporated solvents, control of humidity conditions, design of fabric covering rooms, methods of dope application and factory control in operation, studies of ventilation and hygiene. The latter is a matter of some importance as cases of so-called dope poisoning have in some instances been observed, generally in the form of eruptions on the arms of the workmen or the development of greatly swollen hands. By the elimination of all highly poisonous dope solvents such as tetra-chloro-ethane and the installation of suitable ventilation systems much of this trouble has been obviated. Through the development of emollients the hands and skin of the workmen have been protected from troublesome effects.

Glue for Laminated Construction

The very extensive use of laminated construction for wooden parts of the NC and other Naval seaplanes is dependent upon the establishment of a correct glue



Forward cockpit of NC boats

practice. In the NC a good deal of hide glue had to be used because, while it was realized that such glue is not waterproof unless protected by varnish, developments in the use of casein and other waterproof glues had not proceeded far enough to render their use safe and dependable. Since the NC's were started, considerable progress has been made, and the present practice is to use waterproof casein glue throughout.

The British and German aircraft builders have used a type of casein glue composed usually of casein, slaked lime, caustic soda, sodium fluoride and paraffin oil, the three latter ingredients being used in small percentage. Contemporaneously American aircraft plants have been experimenting with types of casein glue for plywood construction produced in this country. The Bureau gave encouragement to experiments along this line and took up with the Forest Products Laboratory and the manufacturers the subject of the utilization of casein glue for strength parts of airplane construction. Through some intensive work, these glues were soon developed to such an extent that three were placed on the market by individual manufacturers in a form ready for use.

These products were all tested by the Forest Products Laboratory and found to give results which indicated their superiority over hide glue. The art of employing these glues in aircraft construction was developed with great rapidity. One of the prime requisites was the use of a power mixer for the thorough incorporation of the glue with the aqueous medium. The uniformly high strength of joints made with this glue soon indicated the value of using it almost exclusively in place of hide glue and instructions along this line were sent to all naval contractors together with information in regard to using this new type of cold glue. At the same time through arrangements made with the Forest Products Laboratory, men were trained and sent to the various plants to install the process.

Drying Process Devised

At first some difficulty was had with laminated construction where many laminations required a large quantity of glue and necessarily a large quantity of water. This water would pass into the wood and retard the hardening of the glue. Later on it was found that when these pieces were dried in a warm room or in a dry kiln in the same manner as wood having too high a moisture content, the excess water would evaporate and an excellent joint resulted.

Specifications were issued for plywood constructed with blood albumen glue, this type of plywood being extensively used for hull sides and tops. It was found that panels made with blood albumen glue gave much greater strength if tested immediately after long-time soaking than panels made with casein glue. For this reason the blood albumen glue is preferred for the construction of pontoons and hulls which are exposed directly to the action of salt water. The tops of some of the NC hulls are covered with blood albumen veneer and others with the usual two-ply spruce planking riveted over fabric set in marine glue. The latter practice is somewhat heavier and more expensive but has greater life in service due to local stiffness, elasticity and ample fastening.

The power plant arrangement was originally designed to employ three Liberty engines mounted between the wings in a symmetrical manner and driving three tractor propellers. The radiators were mounted in front of the engines in the slip-stream of the propellers so that a good current of air would blow through the radiator when running at a low speed on the surface of the water. The slip-stream was also used to drive the small windmills which pump gasoline from the main tanks in the

hull to the gravity tank in the upper wing. In a similar manner, a small windmill-driven generator in the slip-stream furnishes current for the radio and for charging the storage battery for the electric self-starters.

A feature that is new in this boat is the use of welded aluminum tanks for gasoline. There are nine 200-gal. tanks made of sheet aluminum with welded seams. Each tank weighs but 70 lb., or 0.35 lb. per gal. of contents, about one-half the weight of the usual sheet steel or copper tank.

How the NC Boats Were Built

The plant of the Curtiss Engineering Corporation at Garden City, N. Y., was of insufficient size for the building of flying boats of the dimensions of the NC-1. It was, accordingly, necessary for the Navy Department to authorize the building, at its own expense, of a building attached to this plant of sufficient size for the complete assembly of two of these flying boats at one time. In addition, the ordinary facilities of the Curtiss company were such that it was certain that the attempt of that organization to carry out in complete detail the entire construction of these flying boats would be productive of most serious delays in completion. It was decided to build them on the assembly basis; that is to say, the various elements would be built by different plants turning out a product of a somewhat similar nature, or one requiring workmen of similar qualifications to those ordinarily employed for work of the nature of that in contemplation. These different elements would then be shipped to Garden City to be assembled there into the completed flying boats. As a result of this decision, different parts were built at the following places:

Boat hulls—Curtiss Engineering Corporation, Garden City, N. Y.; Lawley & Sons Boat Co., Boston, Mass.; Herreshoff Co., Bristol, R. I.

Tail booms—Pigeon-Fraser Hollow Spar Co., Boston, Mass.

Gasoline tanks—Aluminum Company of America, Pittsburgh, Pa.

Wings, control surfaces and struts—Locke Body Co., New York City.

Nacelles, major details, gasoline system and all wiring—Curtiss Engineering Corporation, Garden City, N. Y.

Metal fittings—Unger Bros., Newark, N. J.; Beaver Machine Co., Newark, N. J.; Brewster Body Co., New York City.

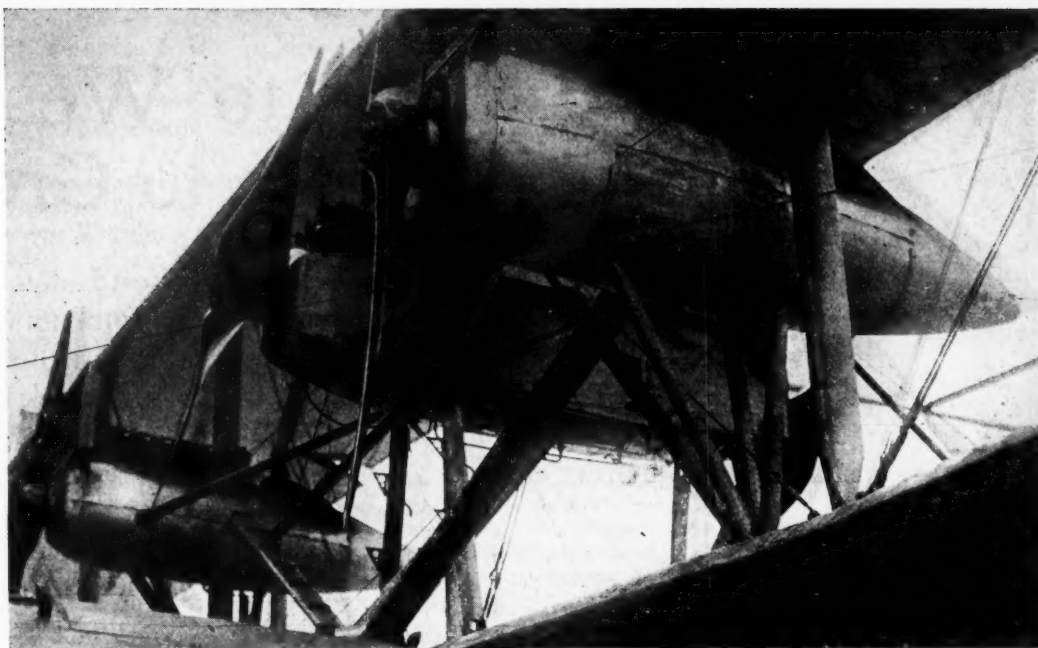
Wing tip floats—Albany Boat Co., Albany, N. Y.; Naval Aircraft Factory, Philadelphia, Pa.

Liberty engines—Packard Motor Car Co., Detroit, Mich.; Ford Motor Car Co., Detroit, Mich.

There was also not available at any operating station hangars of sufficient size for housing these flying boats. Construction was arranged for by the Navy Department at the Rockaway Beach Naval Air Station of a building of sufficient size for housing two of these boats. Due to their very large size, special handling arrangements of the marine railway type for getting them into and out of the water were necessary and were provided. Rockaway Beach was chosen for the location of the hangar and handling arrangements on account of its nearness to the Curtiss Engineering Corporation plant and of its excellent location for carrying out the flying tests.

The first of these flying boats was completed and flown Oct. 4, 1918, or approximately 1 year from the commencement of the design. The trials were a source of great satisfaction, as it was soon demonstrated that the control and balance in the air were very satisfactory and in accordance with the prediction of the wind-tunnel tests, and that the performance on the water was all that could be desired and entirely justified the confidence

How the engines were placed in the NC boats. Note two engines in center



placed in the model tests in the towing basin. No structural weakness developed and the speed came out as predicted. In short, this flying boat designed from theoretical and model experimental data, combined with the practical experience of a half dozen or more people, performed in every way so close to its designed characteristics as to justify completely the methods of the naval architect as here applied in the design of a flying machine.

Changes Made After Completion

As flying tests on the first boat were continued, many changes were tried to improve the original design and, as these were found advantageous, were incorporated on this and on the other three boats building. The Bureau of Steam Engineering, at this stage, was able to improve the performance of the boat materially by the application of new propellers designed in that Bureau. The NC-1 was originally fitted with standard Navy low-compression Liberty Engines, which were found to be entirely satisfactory, but during the period that the NC-1 was being tested with these engines the Bureau of Steam Engineering, in its experimental laboratory at the Washington Navy Yard, perfected carburetor adjustments on the high-compression Liberty Engines which materially improved its economy. Since the high-compression engine gave greater power than the low-compression type, these engines replaced the original installation on the NC-1. With the new propellers and engines, the boat got out of the water and flew easily with a total weight of 24,700 lb. The designed load was 22,000 lb. Besides providing propellers and engines for the boat, the Bureau of Steam Engineering supplied a remarkably efficient electric self-starter to each engine. This type of self-starter, the Bijur, weighed only 35 lb., and by this improvement it was possible for the pilot to start any engine without leaving his seat. It is believed that this constitutes the first application of an electric self-starter to the Liberty Engine.

The month of November, 1918, was spent in thoroughly trying out the NC-1. Among other flights a round trip from Rockaway, N. Y., to Washington, via the entrance to the Chesapeake Bay was made with nine people on board. On Nov. 25 the NC-1 broke the world's record for passenger carrying, having on board in the air fifty-

one persons. One of these was a stowaway, who had concealed himself in the interior of the hull for over 1 hour prior to the start of the flight and is probably the first man deliberately to stow himself away on an airplane to make a voyage. On these flights Naval Constructor Richardson was in charge and was one of the pilots.

After making various minor improvements, it was concluded that the maximum which could be obtained from three Liberty Engines had been reached and no further improvements in performance could be expected until geared Liberty Engines became available. These were still in an experimental stage. It was apparent, however, that the flying part of the craft could sustain a greater load if more power were available, and it was accordingly decided to add a fourth engine, making a total of four Liberty Engines. The second boat completed designated as NC-2 was, therefore, fitted with four Liberty Engines arranged as two pairs of tandems and on its trials in March, 1919, successfully flew with a total weight of 28,000 lb. The addition of the fourth engine, which increased the dead weight of the boat by about 1500 lb., permitted about 3300 lb. of extra weight to be carried, or a net gain of 1800 lb.

The NC-3 and the NC-4 were completed in April, 1919, and were likewise fitted with four high-compression Liberty Engines but with a somewhat different arrangement. In these two boats two engines were arranged on the center line as a tandem pair with the other two engines mounted on the wings as tractors, as were the wing engines on the NC-1. In these boats a further change was made by omitting the center nacelle and placing the pilots in a cockpit in the hull. This arrangement of engines is novel and has the advantage of concentrating weights near the center of the boat so that it can be maneuvered more easily in the air.

Due to injury to two outer wing sections while at anchor in a gale late in March, the NC-1 was temporarily put out of commission. After the completion of weight lifting trials on the NC-2, the outer wing sections of that boat were transferred to the NC-1 as no spare wings were available. Except for this regrettable injury, all four of these boats would have been able to leave Rockaway Beach together for the transatlantic flight.

(To be concluded)

Why Our Exports to West Indies Should Continue to Grow

When American automobile factories invaded the West Indies as an export field, only the wealthy bought cars and most of the shipments were of high-priced vehicles—but conditions have changed there, and the planter and even the small farmer wants a car—Also the field of the truck is expanding rapidly. The facts set forth here in a U. S. Report are surprising, unless you have been watching closely.

LATIN-AMERICAN trade to-day is regarded as holding the greatest export possibility for the automotive industry. One third of that trade now goes to that little group of islands known as the West Indies, which includes Cuba, which takes 84 per cent of the exports for the islands. But the possibility of trade with these islands is in its infancy. The truck has never been appreciated there, and there are few places where there is greater need for trucks.

The West Indies are prosperous, following the large returns from sugar, and where a few years ago the Americans and wealthy residents were the only probable customers, now the small planter is in the market for a light car and all grades of planters are learning the value of motor trucks in regions where bullock carts have been used. So it will be seen that the possibilities are just unfolding.

The Latin-American Division, U. S. Bureau of Foreign and Domestic Commerce, has prepared an exhaustive review of the trade situation in the West Indies, designated as Circular No. 57, published this week. There is a wonderful fund of information in this circular, much of which is reprinted here.

The circular shows that from the fiscal years 1913 to 1918 the value of our export of motor vehicles and parts to Cuba multiplies 20 times.

The increase in the number and value of our exports of automobiles and parts, and motorcycles to Cuba is shown in the following record of these shipments in a pre-war year, in two full years of the war, and in the 9-month fiscal period from July-1, 1918, to March 31, 1919:

Articles	YEARS ENDED JUNE 30—						NINE MONTHS ENDED MARCH 31, 1919	
	1913		1917		1918		No.	Value
	No.	Value	No.	Value	No.	Value		
Automobiles:								
Commercial	14	\$23,639	327	\$722,519	554	\$1,130,982	456	\$888,636
Passenger	223	242,686	3529	2,525,091	2975	3,020,803	1326	1,955,579
Engines	5	718	2	489	13	3,726	6	2,805
Tires		12,322		1,019,915		1,326,233		1,492,271
Parts		35,928		906,710		1,928,276		1,012,805
Motorcycles	43	8,285	73	15,076	165	36,408	77	19,718
Total values....		\$323,578		\$5,200,730		\$6,565,438		\$5,371,814

At the present rate of shipment the value of our automobile trade with Cuba in the present fiscal year will exceed that of 1918. It has already exceeded the total value of the 1917 exports. However, the rate of exports of passenger cars has decreased this year, though the average value of the cars shipped has risen from \$1,018 in the last fiscal year to \$1,474 in the first nine months of the 1919 fiscal year.

There has been a recent gain in the number of passenger cars exported, as the average monthly number from January to March, inclusive, 1919, was 151, while from July to December, inclusive, 1918, the average per month was 145. There was also a gain in monthly shipments of commercial cars from an average of 46 in the last six months of the 1918 calendar year, to 58 in the first three months of 1919. The table given shows a marked rise in our exports of automobile parts and tires to Cuba in the current fiscal year, the total value of these two items in the nine months ended March 31, 1919, exceeding the total for the whole fiscal year 1918.

February of 1919 was a particularly good month for motorcycles, as 26 such machines, or a third of the total for nine months, were exported to Cuba in that month. February's shipments of 213 passenger cars was the largest monthly record since the shipment of 214 in July last.

Census of Cars

No exact census of automobiles in Cuba is available, but the United States has shipped to that island in the last seven years 13,043 passenger cars and 1,483 commercial vehicles, making a total of 14,526 cars, or one for every 180 persons. This estimate does not take into account any cars shipped into Cuba before 1913, either from the United States or Europe, nor, on the other hand, does it consider the cars discarded because of breakage. Some of the cars accredited to Cuba are forwarded to the Isle of Pines, where about a fifth of the population is American, and where, according to a 1917 estimate, there are at least 250 cars. Good roads in the Isle of Pines have aided in the sale of automobiles.

Havana, the capital and largest city in Cuba, with a population of about 400,000, was reported in 1915 to have 3,400 automobiles in use. Since that year we have sent 11,164 passenger cars and 1,429 motor trucks to Cuba, most of these going to Havana, the chief distributing center of the island. Cuban statistics for 1917 show that 3,325 cars were received at Havana in that year, 38 at Nuevitas on the eastern coast of Camaguey Prov-

ince, 34 at ports in Santa Clara Province, 30 in the Province of Oriente, 14 in Matanzas Province, and 12 in the Isle of Pines. Santiago, the second largest city in Cuba, the capital of Oriente and the principal port on the southern coast, with a population of 55,000, has about 400 cars. Camaguey, the capital and chief city in the Province of the same name, with a population of about 50,000, was reported in 1918 to have about 200 cars, while adjacent towns had from 10 to 50 each.

The remarkable increase in our shipment of cars to Cuba in the last five years indicates the growing popularity of the automobile in that island. The motor car not only appeals to the class of people of Spanish descent who are fond of driving through city boulevards on late afternoons, but it also supplies a need for both urban and rural transportation of passengers and merchandise. Havana has one of the finest boulevard systems in the world, boasting nearly 200 miles of paved streets. Naturally, therefore, with the easy demonstration of the automobile on these boulevards, it won immediate favor.

Rival of Street Cars

An autobus service was inaugurated in Havana last year, connecting the suburbs of the city with the water front. The fare rivaled that for street car service, and the new bus line proved so popular that the municipal authorities recently received a request for permission to establish nine more auto lines. The cars used in this service are of American make and carry about 10 passengers.

Motor trucks are replacing the mule-drawn, two-wheeled carts in city streets, and also on sugar plantations. The natural slowness of the cart traffic is further impeded in the cities by the narrowness of streets, and the economy of time in the use of motor trucks has been demonstrated under the pressure of war demands for Cuban products. In the country the trucks are used for transporting manufactured supplies and foodstuffs into the interior, and native products to the cities.

While the railway transportation of Cuba has been much improved in recent years, there being now about 2,600 miles of track in the country, connecting the larger cities of the coast and the interior, there still remain many rich agricultural sections where the railway has not penetrated. Along the coast much traffic is done by small sailing vessels and motor boats that ply between the towns and various landing places on the numerous bays.

Cuba is beginning to realize the value of the motor vehicle to supplement transportation by railway and coasting steamers, and it is facilitating motor transport by repairing many of the old military roads, and also by the construction of new highways. There are good roads along the coast, but in the interior many of the roads are impassable except by pack mules. The Cuban Secretary of Public Works placed before the Congress some time ago a plan for a general system of macadam roads throughout the island, which would enable motor cars to go from Pinar del Rio in the west, to Santiago de Cuba in the east.

In addition to the principal highways extending east to west, there are to be branch roads connecting the cities in the interior with the coast. The length of the island is about 740 miles, and the width varies from 22 miles at Havana, to 160 miles in the Province of Oriente. The total area of the country is about 45,000 square miles, the eastern and western section being of a mountainous character, while in the central provinces the land is gently rolling. To cover all this territory with

a network of roads, in accordance with the project presented to the Cuban Congress, would require a sum estimated at \$100,000,000, which is not now available.

The Congress has already appropriated for road construction millions of dollars in smaller sums at various times, and there are now about 1,250 miles of good roads on the island. Work in all the Provinces progresses as appropriations become available. The Cuban newspapers actively support the good-roads movement, and one Havana daily advocates the use of prison labor in making road repairs. Cuba has an abundance of lime and manufactures cement for road construction, but road-making machinery must be imported from the United States. The Automobile Club of Cuba, with headquarters at Havana, also co-operates in the road propaganda and issues a map of roads in Havana, Pinar del Rio, and Matanzas Provinces.

In 1917 the value of the total exports of Cuban sugar was \$305,300,000, the value of the tobacco exported in that year was \$30,000,000, of minerals \$11,000,000, of fruit, vegetables, honey, native woods, hides, skins and other exports \$20,500,000, making the total value of the years exports \$366,800,000. The imports in 1917 amounted to \$272,500,000 giving a total foreign trade of \$639,300,000, with a favorable trade balance of \$94,300,000. As the population of Cuba is approximately 2,700,000, the exports per capita in 1917 were \$136, the imports \$100, and the total foreign trade \$236 per capita. The trade of the island with the United States alone in 1918 was \$185 per capita.

The high figure of Cuban trade per inhabitant suggests the commercial possibilities of the island. At present the population is about 59 inhabitants per square mile, the Cuban Government estimating that 70 per cent are white and 30 per cent colored. The annual increase of the population is estimated at 90,000. Since the introduction of sanitary measures during the American occupation the country has been unusually healthful, its death rate of 12.54 per thousand being one of the lowest in the world. About one-seventh of the total population of Cuba is found in Havana.

Havana the Starting Point

The methods of developing trade are essentially the same as those followed in the Middle West of the United States, questions of price, terms of payment, quality, promptness of delivery, and other conditions entering into the trade here as elsewhere.

Many large American firms have well located branch houses in Havana, usually in charge of capable American citizens. Other concerns have their business in charge of sales agencies, sometimes American, sometimes Cuban or other, which handle several allied lines. A few of these agencies have attractive buildings and carry extensive stocks for several factories. To a great extent dealers in American lines place orders with traveling salesmen who visit Cuba, or they send their own buyers to New York and other markets to purchase direct.

The general practice in entering the Cuban market with new makes of motor trucks or pleasure cars is to open a general sales office or contract with an established firm in Havana, allowing this office to appoint agents in the Provinces who receive a portion of the sales commission allowed by the factory. In Havana automobiles are displayed in attractive show rooms.

In other Cuban cities the principal garage owners act as subagents for Havana representatives of American

cars, and these provisional agents do a constantly increasing business in both passenger cars and trucks. They are mostly persons of limited means, however, and do not expect to make outright purchases of cars. They usually have two or three cars on exhibition, perhaps of different makes, and they also handle tires and other accessories.

Catalogues, even in Spanish, are of little use in initiating trade in Cuba. Advertising in the local press is better, but American houses will do best to employ good representatives who will study all the conditions that affect the trade, who will make acquaintances and establish agencies.

One of the small points for automobile dealers to remember is that Cuba enforces a strict antiglare law, and care must be used in the selection of automobile lamps. Occasional difficulties reported from the Cuban custom houses over the appraisal of automobiles and parts indicate that a special study should be made of tariff requirements, in order to avoid errors in declarations, as they lead to fines and annoying delays.

The recent establishment in Cuba of several branches of American banks affords the island needed facilities for financing crops and handling imports. Automobile houses inaugurating a Cuban business will find these branch banks of value, also, in furnishing credit information on prospective agents in the Provinces.

Porto Rico

The commerce of the United States with Porto Rico is not included in the total figures of our foreign trade, but the location of the island, as well as the character of its people, products, and needs, classes it naturally with others of the West Indian group in a survey of Latin American markets.

After Cuba, Porto Rico is our best automobile customer in the West Indies. In the last two years the annual shipments of motor vehicles, parts, and accessories from this country to Porto Rico averaged \$2,000,000, or a third as much as our exports of this class to Cuba. Before the war our exports of motor vehicles, parts, and accessories to Porto Rico were more than twice the value of those to Cuba. If the exports of cars and parts to Porto Rico are added to the total of those to Latin America in the calendar year 1918, our Porto Rican trade in automobiles is equal to 5 per cent of our total automobile trade with Latin America, and to 20 per cent of our West Indian trade of this character.

The war markets for sugar and other tropical products, which did so much to increase Cuba's buying power and imports of automobiles, led to similar conditions in Porto Rico. The following table of the exports of automobiles from the United States to Porto Rico in the last six and one-sixth calendar years shows an increase in the annual rate of these exports of 250 per cent over that of the pre-war period:

Years	AUTOMOBILES		Parts, Value	Tires, Value	Motor- cycles, Etc., Value	Total Value
	No.	Value				
1913.....	294	\$365,391	\$82,872	\$307,179	\$46,543	\$801,985
1914.....	380	336,045	70,522	235,205	35,656	677,428
1915.....	805	622,586	102,071	313,429	25,435	1,063,521
1916.....	1293	988,551	144,845	537,296	24,516	1,695,208
1917.....	1339	1,222,453	205,525	712,052	31,241	2,171,271
1918.....	641	856,052	241,562	812,444	24,493	1,934,551
Jan.-Feb., 1919.	138	221,263	30,124	133,191	6,383	390,961

These figures show that the highest point in our automobile exports to Porto Rico was in 1917. The record for

the first two months of the present calendar year exceeds by 45 cars and \$123,569 the number and value of the automobile exports in the corresponding period last year, indicating that the 1918 record will be broken and possibly even the 1917 figures exceeded in the current year. The increase in the value of automobile parts in the 2-month period this year was \$6,113, in tires the gain was \$40,035, and in motor cycles (including bicycles), \$3,318. Motor vehicles and parts comprised 3 per cent of our total shipments to Porto Rico in 1918.

The total number of motor vehicles in operation in Porto Rico on June 30, 1918, was 4,739, consisting of 3,422 private automobiles, 842 public and 60 municipal cars, 80 private and 125 public trucks, and 210 motor cycles. Since that date we have shipped to Porto Rico 38 trucks valued at \$102,644, and 308 passenger cars valued at \$441,581, and motorcycles worth \$18,152. These figures indicate that 4,875 automobiles were in use in the island on March 1, 1919, or a car to every 255 persons, considering the total population as 1,243,300, according to the figures of the last census. The 1918 assessment of automobiles in Porto Rico showed an average value of \$464 per car. The ownership of cars is not confined to the wealthy Porto Ricans who purchase expensive machines; many people in moderate circumstances possess automobiles, and use them to great advantage for transportation as well as for pleasure driving.

The island is about 100 miles long by 40 miles wide, and autobus lines furnish satisfactory service in covering the sections of the country where railways are not available.

Porto Rico has about 750 miles of macadamized Government roads. During the last year \$1,040,913 was spent on road construction and repair. In 1916 the legislature authorized the issue of \$2,000,000 of road bonds, and of this appropriation \$500,000 worth of bonds were sold and the proceeds used for road work; the remaining amount is to be issued in similar installments.

Porto Rico's buying power depends largely on its exports of sugar, which in 1918 were valued at \$41,500,000. The remaining exports last year were cigars valued at \$7,100,000, coffee \$5,500,000, and fruits \$3,600,000, the last item being composed chiefly of oranges and grapefruit, cocoanuts, and fresh and canned pineapples. Small amounts of hides and honey are also exported. The total value of the shipments in 1918 was \$74,200,000, while in 1917 it was \$80,900,000. The imports in 1917 were \$53,500,000 and in 1918 they rose to \$63,300,000, showing large favorable trade balances.

Porto Rico ships 90 per cent of its products to the United States, and receives 92 per cent, or a slightly larger share, of its imports from this country. The total value of Porto Rico's export and import trade in 1918 was \$137,500,000, or \$110 per capita. The total insular revenues for the fiscal year 1918 were \$7,100,000 and the disbursements \$6,400,000, the total valuation of public and private property being \$244,000,000. The commerce of this little island is obviously well worth attention, and Spain, France and the United Kingdom compete actively for the trade in normal times.

Dominican Republic

The Dominican Republic, covering the eastern two-thirds of the island of Haiti, located between Porto Rico and Cuba, is comparatively undeveloped. With an area of 20,000 square miles it has a population of only about 700,000, or 35 inhabitants per square mile, in contrast

with the average of 300 per square mile in Porto Rico.

In common with other West Indian countries, the Dominican Republic has had a share in the prosperity arising from the great demand in war years for sugar and other tropical products, and this fact has had much to do with the rapid increase in the shipments of automobiles in recent years from the United States to Dominican ports. In 1912 the Dominican Republic took only one-half of 1 per cent of our automobile exports to Latin America; in 1918 this percentage had more than doubled, the actual amount being nearly 15 times greater.

The following table shows the increase in our exports of automobiles to the Dominican Republic in the last seven fiscal years:

Year	COMMERCIAL CARS		PASSENGER CARS		Parts, Value	Tires, Value	Engines, Value	MOTOR-CYCLES		Total Value
	No.	Value	No.	Value				No.	Value	
1912	13	\$12,739	*	*	\$3,381	\$2,934	.....	14	\$2,945	\$19,054
1913	1	1,858	7	\$5,382	1,331	2,306	.....	2	376	13,822
1914	1	1,800	11	15,195	3,439	2,902	.....	2	376	23,712
1915	2	3,372	28	14,609	3,633	3,062	.....	.....	.....	24,676
1916	4	5,173	131	60,127	12,389	18,223	\$833	12	1,733	98,478
1917	22	23,640	191	96,173	35,301	37,441	400	10	1,173	194,128
1918	22	13,323	248	157,607	39,816	61,684	459	10	1,029	273,918

*Passenger cars included with commercial cars.

The largest item of increase in our exports of motor vehicles to the Dominican Republic has been passenger cars of moderate price. The shipments of motor trucks showed a noticeable growth in the last two years, and the export of parts and motorcycles were fairly steady. The above figures show that 680 automobiles have been shipped from the United States to the Dominican Republic since 1911. The American consul at Santo Domingo reported in December, 1918, that there were about 650 automobiles in use in that southern district. In the northern district of Puerto Plata 200 automobiles were estimated in March, 1919. As these are the principal districts with road facilities, it is probable that there are not more than 1,000 cars in the Republic.

The introduction of automobiles and the increasing trade of the Republic has led to an active interest in the extension of good roads. At present there are only about 150 miles of road available for motor travel. Three fine boulevards lead out from the city of Santo Domingo in different directions.

Automobiles, as well as other conveniences and luxuries, are popular with the native Dominicans, and also with the rather large foreign colonies in the Dominican cities. The automobile market has been best in Santo Domingo, 30 different models being in use there, according to a recent report of the American consul. The buying power of the public promises to be larger this year, as the crop outlook is better than usual, and cocoa growers in particular are looking forward to large returns with an increase in prices and shipping facilities.

Because of lack of transportation to Europe in recent years, the major part of the Dominican products have gone to the United States, the total exports amounting to \$21,500,000 in 1916, and to \$22,400,000 in 1917, an increase of 100 per cent since the pre-war period. The value of the imports has risen proportionately, from \$8,000,000 in 1912 to \$17,500,000 in 1917.

Haiti, comprising the western third of the island of this name, is less developed, agriculturally and commercially, than the Dominican Republic, though the population is much greater. With an area of 10,200 square

miles, Haiti contains about 2,500,000 inhabitants, or 245 per square mile. One of the chief obstacles to be overcome in the development of an automobile trade in Haiti is the lack of good roads.

The Haitian Government is beginning to realize, however, the need of highways to supplement the meager railway service which connects only the principal ports of the country, and gives an outlet merely to the regions nearest the coast. In the last two years the Haitian Department of Public Works has made notable progress in the construction of better roads, which will open up rich interior sections to communication with the ports.

In the last six fiscal years 181 passenger cars and 18 motor trucks have been exported to Haiti from the United States. The recent rapid increase in this trade is shown by the following table:

Years	COMMERCIAL CARS		PASSENGER CARS		Parts, Value	Tires, Value	MOTOR-CYCLES		Total Value
	No.	Value	No.	Value			No.	Value	
1912.....	2	\$910	*	*	\$331	.....	.....	.....	\$1,241
1913.....	3	5,553	38	\$14,409	2,212	\$765	1	\$62	33,091
1914.....	.....	.....	2	1,485	1,095	2,336	.....	.....	4,916
1915.....	.....	.....	.....	.....	185	526	.....	.....	711
1916.....	.....	.....	10	3,788	3,285	988	.....	.....	8,061
1917.....	2	1,324	29	13,780	3,962	2,287	4	1015	22,368
1918.....	11	10,578	102	54,613	24,385	13,091	14	4026	106,693

*Passenger cars included with commercial cars.

These figures indicate that Haiti imports inexpensive types of cars. After the temporary cessation of the automobile trade following the outbreak of the war, Haiti's increased purchases showed, as was the case in the other West Indian countries, a larger buying power due to the profitable marketing of native products. The Haitian imports of automobiles, parts, and tires multiplied 100 times from 1912 to 1918, yet in the latter year they were not half the value of the automobile imports of the Dominican Republic. Statistics of the Haitian automobile trade for the calendar year 1918 show a slight decrease from the above record for the 1918 fiscal year, though 150 per cent more than for the 1917 fiscal year.

The United States had about two-thirds of Haiti's trade in normal years, and this share naturally increased during the war. The tie of language draws a large share of Haiti's trade to France, and with unrestricted shipping facilities this trade may be expected to increase. The increase in Haiti's purchases from the United States in war years was small, in view of the great increase in its exports to this country. Our imports of Haitian products, consisting chiefly of dyewoods, coffee, cacao, sugar, and hides, grew from \$800,000, in 1912, to \$4,800,000, in 1918, while our exports to Haiti increased only from \$7,200,000, in 1912, to \$8,000,000, in 1918.

Colonial West Indies

The Colonial West Indies are included in this survey of automobile markets, since the same American selling and shipping organizations cover the colonies as well as the Republics of the West Indies. To a certain extent, the same conditions prevail in all these islands. The areas are limited, railways are few, and highways are depended upon for cart or motor transportation of products to coast points for shipping; therefore roads are in better condition and automobiles find a more ready market than in many larger countries where the lack of good roads delays the development of motor traffic.

The following table shows the exports of motor vehicles

and parts from the United States to the Colonial West Indies in a pre-war fiscal year, and in the last two full fiscal years of the war:

Colonies	Commercial Cars		Passenger Cars		Parts, Value	Tires, Value	Motor-cycles		Total Value
	No.	Value	No.	Value			No.	Value	
1912-13									
British:									
Barbados.....			7	\$5,973	\$5,055	\$4,588	...	...	\$15,616
Jamaica.....	4	\$9,234	62	59,131	25,355	30,004	2	\$500	124,224
Trinidad and Tobago.....			43	39,902	9,119	16,364			65,385
Other British.....			7	6,716	1,157	1,869			9,742
Virgin Islands.....	1	4,250	4	2,131	1,640	540	1	146	8,707
Dutch West Indies.....			19	14,590	1,767	767	1	166	17,290
French West Indies.....			5	3,877	198	115	...	...	4,190
1916-17									
British:									
Barbados.....	1	1,506	121	62,364	14,452	15,666	11	2204	96,192
Jamaica.....	6	8,285	335	202,375	54,854	109,048	32	4672	379,234
Trinidad and Tobago.....	2	5,722	204	112,014	44,060	45,694	26	5318	212,808
Other British.....	1	500	124	80,879	12,868	21,526	10	1949	117,722
Virgin Islands.....			18	9,114	1,876	2,753	...	...	13,743
Dutch West Indies.....	2	2,095	32	19,191	6,052	7,386	2	368	35,092
French West Indies.....	7	13,305	293	154,990	24,672	19,399	5	900	213,266
1917-18									
British:									
Barbados.....	2	3,400	58	33,198	15,089	19,391	14	2763	73,841
Jamaica.....	10	6,775	236	149,673	65,429	109,097	30	5327	336,201
Trinidad and Tobago.....	14	18,361	161	100,571	55,794	105,373	14	2452	282,541
Other British.....	28	89,914	80	50,009	21,446	25,991	31	4167	191,527
Virgin Islands.....	2	2,845	23	12,313	2,844	6,939	...	...	24,941
Dutch West Indies.....			12	7,435	4,707	9,034	3	904	22,080
French West Indies.....	26	49,626	248	146,698	53,518	36,474	4	636	286,952

British West Indies

The best automobile market in the colonial West Indian group is Jamaica, where 1,500 automobiles were in use in April, 1919, according to a report of the American consul in Kingston. As the population of Jamaica is about 800,000, this means an automobile for every 533 persons. Nearly all makes of American cars are represented on the island, where 2,200 miles of fine roads make automobiling a delight. Most of the roads are macadamized highways and are kept in good repair.

The imports of motor cars into Jamaica have more than doubled during the war years. With the resumption of normal conditions and reduction of the high price of gasoline, it is probable that there will be a larger demand for automobiles. There are many well-to-do people in Jamaica who can afford to own cars but who have postponed purchases until after the war. Jamaica imported the largest number of motor cars in 1917, when the total imports of cars and parts, including tires, amounted to nearly \$400,000, the cars being valued at \$195,055 and the parts at \$203,613. The United States had the major part of Jamaica's automobile trade even before the war, and its share has increased since 1914.

Most of the cars imported into Jamaica are passenger models, selling under \$1,000, as small, light cars appear to give better satisfaction on the mountain roads. Electric cars are not used because of the steepness of the roads and the lack of electricity.

Motor trucks are not much in demand except by the Government and large plantation companies. However, their use for general hauling and delivery purposes is increasing. Jamaica is a good market for all kinds of automobile accessories. The trade in motorcycles has grown less rapidly in Jamaica than has the commerce in automobiles. In the pre-war period most of the motorcycles were imported from the United Kingdom, but in the years beginning with 1915 the United States has held first place in this trade.

Jamaica's general prosperity, as well as its good roads, make the cultivation of its automobile markets well worth while. The chief products of the island are gin-

ger, sugar, fruit, and dyewoods, the annual exports of these and other native products ranging in value from \$10,900,000 in 1913 to \$12,000,000 in 1917. The imports into the island have increased from \$13,700,000 in 1913 to \$16,000,000 in 1917. In 1916 and 1917 the United Kingdom followed the United States in the supplying of foodstuffs and manufactured articles to Jamaica, and took a larger share of the island's products than came to this country. In 1914 and 1915 the United States was first in both the import and export trade of Jamaica. Exporters to Jamaica encounter few difficulties in shipping and entering goods, as the customs formalities are simple, and English is the language of the importers.

Trinidad

In spite of its comparatively small area—1,800 square miles—and population of only 370,000, Trinidad is an important automobile market. A report from the American consul at Trinidad early in 1919 placed the number of motor cars in use in the colony at 825, averaging a car for every 450 persons.

One of the chief reasons for the rather large imports of automobiles is the availability of good roads, which were constructed for transportation, by bullock carts, of plantation products to the coast and railway points. Motor trucks are replacing the bullock carts, and this truck service supplements that of the railway and steamship lines.

There are only about 100 miles of railway in the country, while there are 600 miles of good roads.

One of the principal uses for motor trucks is the collecting of cocoanuts from regions not served by railways, and conveying them along the beach to oil or copra factories. However, the salt water, which cannot be wholly avoided, is injurious to both the tires and steel of the trucks, somewhat offsetting the advantages of speedier delivery gained in the use of the motor vehicles. Other native products to be transported from the fields to ships are sugar, cocoa, asphalt, and petroleum. The annual value of the exports of these and other products grew from \$13,000,000 in 1914 to \$20,800,000 in 1916, and the imports ranged from \$14,000,000 in 1914 to \$21,700,000 in 1916, the value of the foreign trade per capita being \$73 in 1914 and \$115 in 1916.

In Tobago, and in other small islands of the British West Indies, the automobile trade is increasing in importance.

Virgin Islands—Distances are too short in these islands to make them good motor vehicle markets. The 1918 trade totaled \$15,000. St. Croix has 100 miles of good roads, St. Thomas about 15 miles and St. John none.

Dutch West Indies—Curacao has 2,000 white population of a total of 33,000. There are no railways and probably never will be any. In May, 1917, there were 140 motor cars. Twelve have been shipped there since.

French West Indies—The population is about 200,000 and because of recent prosperity many families are in position to buy cars. The American consul reported 300 cars and 25 motor cycles in use in March, 1919. Light and inexpensive cars are preferred because of hills. French tires have the preference. Only 20 motor trucks are in use and the possibilities are considerable in this line.

Martinique—The first automobile was demonstrated on this island in 1913. Last year the American consul reported 505 cars and 35 trucks in use. Forty of the cars were French make, the rest American. The area of Martinique is 380 square miles, about half that of Guadeloupe, but it is a superior market. All advertising and correspondence should be in French.

What the Public Schools Mean to the Employer

It is an easy accomplishment to get a manufacturer to condemn the school system of today. Often he will tell you quickly that he will not send his own children to them, and with that show of disapproval, he drops the subject. Then he wonders why the applicants for employment are not better educated. Mr. Tipper supplies the answer.

By Harry Tipper

THE formation of the National Army for service in the war gave us a great deal of information in respect of conditions as to health, education, etc., which was much more valuable than the information previously compiled. The conclusions in respect of health have been the subject of papers and lectures by medical men and of active propaganda throughout the country so that they are having their effect upon our plans.

The information secured as regards education, however, does not seem to have secured the same notice, and so far appears to be practically unknown to business men generally. The reports of the draft show that one in four of the drafted soldiers were illiterate, that is, could not read and write, and from careful calculations made it is estimated that on the basis of the draft the City of New York contains 500,000 illiterates.

Interest of Industry

If this estimate of illiteracy be taken in conjunction with the estimated number of foreign born residing in the City of New York, it is obvious that a very large percentage of the foreign born people are still limited in their communication to the language which their fathers understood and to such stray elements of English as they have been able to pick up; without being able to understand what goes on around them or its significance.

The interests of industry are not served by a large percentage of illiteracy. They are only served properly when there is a common language, a common understanding of political and social ideals and also a common bond of social service, and industry depends for its progress upon the opinions of the worker as a citizen just as much as it depends upon the skill of the worker as a laborer.

A very brief consideration of the amount of illiteracy gives point to the statement which has been made many times in these articles as to the extent to which the foreign born laborer offers a fertile field for I. W. W. propaganda and the propaganda of similar organizations. This illiteracy makes it impossible for the individual to become thoroughly acquainted with the political ideals upon which the organization of the country is founded, the progress of the country, the orderly necessities of organization, and the reason for its laws and its particular character of social development.

The only means by which such people can be reached is by actual conversation in the language which they understand, and this gives added significance to the statement

made some time ago in these articles as to the number of active workers of different races who were concerned in spreading radical, socialist and bolshevist ideas in New York City.

Unfortunately, the manufacturer generally has not taken an intelligent interest in the progress of education, either among his own workers or in his own community. There are a great many notable exceptions to this and some shining examples of intelligent and fundamental interest in the needs of education, and some very practical operating plans to supply this need.

The National Association of Corporation Schools, which has been in existence for a number of years, has records of a sufficient number of these to give the movement a particular significance at this time and to suggest the hope which it offers in connection with the social reorganization that is going on. Even in these schools, however, comparatively little has been done beyond a little education in reading and writing and a great deal of education done to improve the skill of the worker in connection with his work.

It cannot be said of industry at present that it has realized its dependence upon the worker, in his opinions as a citizen, for its orderly progress and its continued freedom from political regulations and interference of a destructive character. Reference has been made in these articles previously to the conditions in the educational systems of various states, even in the institutions of higher learning, but so little interest has been taken in the necessities of this education by the more intelligent part of the community that the requirements for teaching in public schools are so low as to be almost absurd and the character of the education delivered by such institutions equally ridiculous. Such qualifications as are required are merely on routine topics, and do not concern a grasp of human understanding.

Teacher's Pay

The average teacher receives in pay a good deal less than the average day laborer. No attempt is made either by examination or by training to discover whether the teacher possesses those qualities of human understanding which are necessary in order to bring out and develop the mental qualities of the child and in order to guide the thinking as the children pass from one stage in the educational process to another.

The complaints which employers make about the inefficiency of younger employees in spelling, in simple arithmetic and other matters, might be traced back to the inefficiency of the teacher.

iciency of the teachers, who are hard put to it many times to maintain even a reasonable distance between their own knowledge and that of their students.

These facts in connection with education are more important to the manufacturer than the lack of skill which the worker displays when he is introduced into industry; for they affect the whole possibility of orderly thinking in his influence as a citizen and, consequently, affect his point of view upon every economic question which is forced into the political arena or which has become the subject of a political controversy.

Not long ago, in conversation with a manufacturer employing about 5000 men in a small town where his influence upon the community was very large, the man said that the trouble with the worker was that he did not know anything about the economics of industry, the worker, he said, seemed to have an opinion that it was possible to produce less and yet earn more without bringing disaster upon the industrial processes.

I asked the manufacturer how long he had conducted his factory in that town. The reply was that the factory had been conducted for 22 years in that place. When I pursued the matter far enough to ask him what the curriculums were in the public and high schools, if the schools were used as centers of social development, what papers they had, what kind of men composed the school board, the manufacturer was obliged to answer all these questions with a vague general statement or by frankly admitting that he did not know.

When I inquired by what process he supposed the workers were to be educated to these economics, he talked as if the whole educational system was a matter of so little importance to him that he need not know anything about it.

This is not an isolated case. It is typical of the attitude of manufacturers all over the country. It is typical of manufacturers' associations and trade bodies of all kinds with a few notable exceptions. It is true in the last few years, in some states, chambers of commerce have appointed committees which are showing interest in the educational systems of these states. But there is no real understanding on the part of industry as to the importance of education and the effect which the present systems of education have upon the adult opinions of a very large proportion of the population.

What Americanization Means

Americanization of the worker and of the children of foreign-born parents means a great deal more than speaking the English language. It means the absorption of the English language, of the American literature, of the American habit of political and social thought to such a degree that thinking will be done in the English language and in accordance with the American ideals.

Until the war broke out Americanization meant little more than the possession of citizenship papers in the minds of most people and no one could view the proceeding in a naturalization court without recognizing the absurdity of this process as a means of making desirable American citizens. For years such courts have been a by-word, and there has been no organized public protest of any dimensions and no pressure brought upon the Government to change matters.

Similarly, inefficiency of the educational system has been the subject of many papers, of such conversation, of many resolutions in manufacturers' associations and other trade bodies, but no pressure has been exerted and no influence brought to bear to change the system or to improve the character of the teaching method.

The only large experiment of recent years undertaken by any body in connection with educational work was the attempt made by the government of the City of New York in the time of Mayor Mitchell to rearrange the system of teaching and the attempt was one of the causes for the defeat of that administration.

Industry is interested in better production but better production can be secured only by better men and better social conditions, a more orderly form of social organization and a more peaceful industrial development. These can be secured only by better methods of education, by a deeper interest in the educational measures and by the industrial leader justifying his social obligation through his public interest in such matters.

The possibilities of educating the worker in respect of his skill in his work depend a good deal upon his previous education. This is particularly true as industry grows larger and centers its productive efforts more and more in one manufacturing unit and distributes products from that unit over a wider and wider area. The co-operative element in modern industry is becoming so important that the manufacturer must recognize it. The social obligations of big business are large. They have not been recognized as obligations because of a personal taste or outlook, though there are many examples of a fulfillment of these social obligations by individual manufacturers.

So Many Involved

Big business affects so many workers in an individual factory and controls so thoroughly the necessities or conveniences of life for groups of people who would be quite helpless without such distribution; that the social obligation is a definite and vital one and it includes the educational system, the status of education, the character of the educational work and the kind of educators involved in the system. Teachers in the grade and high schools, from which places 90 per cent of the children go directly into industry or some form of industrial work, are commonly without any economic training whatsoever.

It is not surprising that the great body of the people do not understand big business and that they fail to appreciate their dependence upon orderly industrial organization. They have had no opportunity to discover these facts, and their teachers do not know.

It is possible that many manufacturers, if they were placed in the position of stating clearly and simply the fundamental necessities of industrial organization in connection with the present social and political existence, would be hard put to it and might find that their own understanding of the matter was none too good, yet they have been obliged to engage in these transactions to co-ordinate industrial endeavors and to build industrial organizations, so that they, at least, should have a larger measure of understanding of the matter than those who have not had such opportunities.

It is not surprising that teachers in our public and high schools, who have had little opportunity to learn the facts, should be without knowledge of the proper relations of industry and its organization and should be misled by the propaganda of interested politicians.

Such conditions are of importance to every business man and should be the subject of study and active work on the part of every manufacturer.

A REVISED edition of the Gill Piston Ring Size Directory gives the dimensions of piston rings used on most models of automobile, truck and tractor engines manufactured from 1914 to 1918, inclusive. The directory contains much other information about piston rings.



The F O R V M



Tappet Clearances on Valve-in-Head Engines

By Geo. A. Weidely.

AT the Ottawa Beach meeting of the S. A. E. in a discussion following the reading of one of the papers, the reader of the paper made a statement to the effect, as the writer recalls it, that valve in head motors were not wholly suitable for pleasure car purposes, partly on account of them being noisy due to the fact that the clearance between the rocker arms and the valve stems becomes greater as the motor heats up due to the reversal of conditions on account of the rocker arm. He admitted during the discussion that for greatest efficiency, as well as greatest horsepower, the valve in head motor will show better results than L or T head.

The statement mentioned above is undoubtedly correct when it refers to motors in which the push rods and rocker arms, or at least the push rods alone, are out in the open and subject to the air currents induced by the fan or the forward motion of the vehicle, but when the rocker arms and push rods are properly inclosed, as they are in the Weidely Bull Dog, and when the cover plates inclosing these parts are arranged for proper gaskets, we find that the conditions mentioned by the reader of the above paper do not obtain.

In order to settle this matter and to satisfy myself as to the truth of the above statement, immediately upon returning from the summer meeting I arranged for a test of several motors of like model after they had gone through their usual tests. They were cooled to a temperature of 60 deg. by leaving them stand over night and leaving cold water run through them. The rocker arms were then accurately adjusted to a definite dimension. These motors were then put on the dynamometer, run at their usual power for a period of two hours, the temperature being kept at 200 deg. Fahr. by a thermostatic arrangement on the water tank. Measurements were again taken of the clearance between the rocker arm and valve stem and conditions were found to be as shown on the following table:

VALVE TAPPET CLEARANCE TESTS, 6-30-19

No.	Clearance		Remarks
	Hot	Cold	
1	0.008	0.008	Tests made on valve clearances of hot—200 deg.—and cold—80 deg.—motor with side and top cover on.
2	0.006	0.006	
3	0.003	0.003	
4	0.003	0.003	
5	0.006	0.006	
6	0.008	0.008	
7	0.002	0.002	
8	0.006	0.006	

You will note from the dimensions in this table that the clearances were absolutely the same in the cold and hot motor. The result was exactly the same on the several motors tested. One of these motors then had the top cover, as well as the side plates, removed, permitting the fan to blow on to the push rods from the side, with the result that the difference in the clearance was as shown as follows:

VALVE TAPPET CLEARANCE TESTS, 7-1-19

No.	Clearance		Remarks
	Cold	Hot	
1	0.012	0.015	Tests made on valve tappet clearances of hot and cold motor with side and top cover removed and fan blowing on push rods.
2	0.006	0.010	
3	0.002	0.007	
4	0.004	0.010	
5	0.006	0.012	
6	0.008	0.012	
7	0.005	0.008	
8	0.010	0.015	

there being a variation between cold and hot of from 0.003 to 0.006 in., substantiating the statement mentioned above when applied to a motor equipped with rocker arms and push rods that are out in the open.—GEORGE A. WEIDELY of Weidely Motors Co.

Air Weight and Volume Measurement —Corrections

Page 1399—col. 1—formulae numbers (1) and (2) are omitted from

$$Q = AV = av \quad (1)$$

and

$$\frac{V^2}{2g} + \frac{P}{W} + H = \frac{v^2}{2g} + \frac{p}{W} \quad (2)$$

The next formula should read

$$\frac{V^2}{2g} + \frac{P}{W} = \frac{v^2}{2g} + \frac{p}{W} \quad (3)$$

Page 1399—col. 2—Theory for Gases—2nd line—the word "not" is omitted before "applicable."

Page 1400—col. 1—formula (9) should be formula (8) in

$$W = \int_{V_1}^{V_2} PdV \quad (8)$$

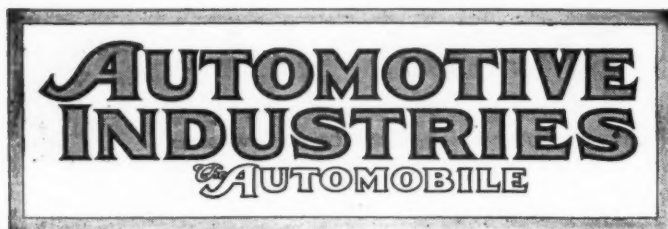
and (9) should be the number of

$$PV^s = P_1V_1^s = P_2V_2^s = K \quad (9)$$

Page 1402—col. 1—next to bottom item— $d_1 = \dots$ should read "the determination of this factor has been discussed in Part I."

Soldering Aluminum

Two pieces of aluminum may be united by soldering or brazing. For soldering, the surfaces must be rubbed down with emery paper with a small quantity of vaseline. The flux may be made up as follows, according to a prescription given by the Soldering Association: Lithium chloride, 15 per cent.; potassium chloride, 45 per cent.; sodium chloride, 30 per cent.; potassium fluoride, 7 per cent, bisulphate of soda, 3 per cent. The joint should be carefully brushed and washed in hot water to remove all traces of the flux. For brazing, metals such as tin, bismuth, cadmium may be used. The process should, however, be used only in exceptional cases.



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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Aircraft Advertising

AS the pioneers of advertising, American manufacturers can not fail to grasp the importance of the advertising that European nations are deriving through their spectacular aeronautical operations.

The journeys across the Atlantic, the sensational feats in France, the exhibits at all expositions, the establishments of sales rooms in practically all foreign countries and the steady publicity through the world press can not fail to impress individuals, governments and imbue them with the idea that Europe is in advance in aeronautical development.

In consequence of these European activities American manufacturers, are losing prestige, opportunity and immediate business.

A recent letter to the Bureau of Foreign and Domestic Commerce from the Commercial Attache at Madrid told of an airplane exhibit held there comprising only Spanish and British manufacturers, where the latter won high praise and wide-spread publicity in the press and gained a valuable prestige with the public. "American airplane manufacturers,"

stated the letter, "might well consider whether it would not be advantageous to use similar propaganda."

At the recent Foreign Trade Convention it was pointed out that Great Britain secured the most suitable landing fields throughout the globe, and that unless America awakes, it will have to take those that are left. At the Pan-American Convention United States Army Officers told the delegates from the Latin-American countries that they could look to the United States for airplanes and supplies with assurance that they would obtain the best manufactured. But in the face of the steady propaganda and the established offices of the European nations, mere talk will not hold Latin-American trade for the United States.

It is important that American airplane manufacturers should realize the need for establishment of agencies throughout the world and a steady propaganda in all nations, so that until trade is developed and firmly established American prestige gained through the war will not diminish.

The Railroads

DURING the war many statements were made as to the methods which would have to be adopted in reconstructing the lines of business which had come more particularly under Government control for the purposes of the war and many suggestions were made as to the remedies to be adopted. It looked as though the situation, which had come about because of the necessities of the war, would lead to a consideration of some of these questions by the public in a more analytical way and, perhaps, induce industrial leaders to suggest action along these lines more freely than they had been accustomed to in the past.

We are now in the process of considering the return of the railroads to private ownership. The recommendation for this return has been made by the President and it is admitted that some arrangement must be concluded by the present Congress to permit of this return. Apparently, however, the public interest has not been aroused in a very great degree as to the items involved in this return and their effect upon the railroad efficiency. There has been little interest shown by industry, excepting where the industries themselves were dependent upon the railroad situation for a large part of their business.

The railroad system, steam and electrical, is the arterial system of industry and the efficiency of the railroad practically limits the possibility of production and distribution. During the early part of the war it was not unusual to find that the delay in the transit of goods so affected business that the question of rate was entirely subordinate. The railroad system has not been keeping pace with the development. New lines have been required for a number of years which are not yet built. Extensions in trackage, distributing yards and terminal facilities are long overdue.

Every manufacturer, no matter in what industrial

operations he may be engaged, is deeply interested in the efficiency and the adequate extension of the railroad system. Upon that depends the possible development of his own business. The automotive manufacturer will not be aided by a weak and inefficient railroad system. His interest will be furthered by a strong and adequate system of railroads which will demand for its complimentary necessities a much larger proportion of flexible transportation, such as the automotive industry supplies.

The public is not aware of its dependence upon efficient railroad transportation and the politicians cannot see further than prohibitory measures. It is up to the manufacturer to study the railroad situation, to use his influence to secure a wise system of regulations and development in the return of the railroads to private ownership and to realize that the development of his industry is so dependent upon the development of this arterial system of distribution that the freight charges are subordinate to the main question and the losses, due to the limitations in the system itself, far exceed the possible costs involved in the rate question.

Aerial Stowaways

IN his story of the building of the NC planes, an instalment of which is printed in AUTOMOTIVE INDUSTRIES this week, Commander Hunsaker of the Navy robs the English boy Ballentyne of some of the romance that attached to him as a stowaway on the R-34 for the voyage across the Atlantic. Ballentyne, it will be remembered, was much written about as the first aerial stowaway. But Commander Hunsaker tells of the test flight of the NC-1. Fifty persons were selected to take part in this flight, a record at that time for an airplane. But when the flight was well under way, it was found that there were 51 persons aboard, the odd one being a stowaway who had hidden in one of the boats an hour before the start. So America really has the first aerial stowaway honors, too. Also this is an indication of the thoroughness with which Commander Hunsaker has written the official story of the NC-boats.

Electricity Direct from Coal

THE problem of turning the chemical energy of coal directly into electrical energy to which reference was made at the S. A. E. summer meeting by Prof. Norman, has been regarded as one of the great outstanding problems of science for upward of thirty years. While a number of solutions have been proposed, and while from a scientific standpoint the problem may be regarded as solved, from an industrial point of view nothing has yet been accomplished along this line.

Our present process of obtaining electrical energy from coal is a rather involved one. By burning the coal we first convert its potential energy into heat energy, using the gases of combustion as the heat carrier. Then the heat is transferred to water which is thereby converted into steam. In the steam engine the heat energy is converted into mechanical energy and

in the dynamo another conversion takes place into electrical energy. Each of the conversions is accompanied by losses and the efficiency of the entire process is generally not over 10 per cent, though by the use of the most up to date equipment and methods, such as high pressure super-heated steam in large turbines, this can be materially improved.

An example of the direct conversion of chemical potential energy into electrical energy is afforded by the ordinary primary electric cell. Here zinc is converted into zinc sulphate and the energy of the reaction appears in the form of electrical energy. By making the resistance of the outside circuit very high as compared with the internal resistance of the cell in other words, by withdrawing energy from the cell at a very low rate compared to its size, we can obtain a very high efficiency.

It must not be forgotten, however, that thermal efficiency or efficient transformation is not a reliable index of the commercial practicability of any process, and the above cited examples illustrate this very well. Electrical energy derived from coal by the usual process at an efficiency of 10 per cent is still much cheaper than electrical energy from zinc derived by a process having an efficiency of 60 to 70 per cent. The reason is that zinc costs ever so much more than coal.

If the energy of coal could be converted at the same efficiency as that of zinc it would be a great gain, provided the apparatus required were not too expensive and cumbersome and did not require an inordinate amount of care and maintenance. That such a process is within the range of possibilities there is little doubt, but unfortunately the chances that a commercially practical solution of the problem will be reached within the near future are very slight.

Commercial Aviation's Needs

THE United States should develop a commercial aviation policy promptly because:

(a) The aeronautical industry is going to be an important industry and, having its origin in this country, should be, rightfully, an American industry.

(b) Commercial aviation is going to cut mail and express time to all corners of the globe and become an important factor in foreign trade.

(c) Our army will soon resume a peace-time basis and will reduce its aerial activities. This country must then depend upon a potential aeronautic power rather than an established military one. The potential power for military aviation lies in a well established aeronautical industry, and this in turn can only thrive with the development of commercial aviation.

The reasons are sufficient for action. Eight months have passed since the end of the war gave notice of changing conditions, and yet commercial aviation in the United States has made but little progress.

Prompt action is needed if this country is to have the prosperous industry, the aid to foreign trade, and the insurance against unpreparedness that lies in a well established commercial aviation.

Fords Buy Minority Stock; Will Develop Huge Output Plans

\$75,000,000 Transaction Eliminates Stockholders Who Sued to Collect Dividends

Co-operative Plan to Give Employees Former Minority Profits—Cheaper Car in Abeyance

DETROIT, July 11.—Exclusive ownership of the Ford automobile interests will pass into the hands of Henry Ford, his son, Edsel, and James Couzens, mayor of Detroit, and one of the pioneers in the Ford development, through a \$75,000,000 transaction consummated here to-day for purchase of minority stock holdings.

Edsel B. Ford, president of the Ford Motor Co., is purchaser of all of the minority stock in the company, with the exception of 2,180 shares held by Couzens.

Details of Sale

Details of the sale, financed by a syndicate loan, were made public by Frank L. Klingensmith, vice-president and treasurer. Edsel Ford, previous to the sale, held 300 shares of Ford stock. There were 8300 shares held by outside interests. Henry Ford owned 11,000 shares. Approximately \$12,500 a share was paid for the minority holdings, as follows:

Horace H. Rackham.....	1,000 shares	\$12,500,000
John Dodge.....	1,000 shares	12,500,000
Horace Dodge.....	1,000 shares	12,500,000
John Anderson.....	1,000 shares	12,500,000
David Grey.....	525 shares	6,562,500
Paul Grey.....	525 shares	6,562,500
Phillip Grey.....	525 shares	6,562,500
Alice Kales.....	525 shares	6,562,500
Mrs. A. P. Hauss.....	20 shares	250,000

Added to the price paid for the stock it is estimated that close to \$17,000,000 will go to the government in excess profit taxes.

Financing the Deal

The deal was financed through Bond & Goodwin, New York, and F. M. Holmes of the Old Colony Trust Co., Boston. Henry Ford, though owning the controlling interest in the company, took no part in the negotiations. Acquisition of the minority interest stock is for the purpose of reorganizing the Ford Motor Co., although there is to be no change in the personnel of the officers and department heads.

Through the reorganization plan it is the ultimate desire to make the new company a co-operative one. That is, the employees of the firm would technically succeed the minority stockholders of the old company, as stockholders in the new corporation. This plan was made known by Henry Ford, who said:

"By making it a co-operative company we propose to make it possible in the future to divide with our workers the

melons that have in the past been cut with the minority stockholders."

Concentration of control of the company was precipitated by the desire of the Fords to be free to conduct the affairs of the company without the interference of minority stockholders. The recent suit of John F. and Horace E. Dodge to compel a distribution of profits which Henry Ford had intended to use for plant expansion was one of many instances where he was not left free to direct the policies of the company as he saw fit.

Last February, after a lengthy lawsuit, the Michigan Supreme Court ordered Henry Ford to pay stockholders \$19,275,385 in dividends which had been held back as accumulated surplus for expansion purposes. As the result of this ruling, Ford found it practically impossible to carry out the vast im-

Ford Credit Quickly Taken By Scattered Financial Institutions

NEW YORK, July 16—The \$75,000,000 commercial credit advanced to the Ford interests for acquisition of minority stock holdings was snapped up within a day by financial institutions throughout the country. The paper, bearing 5½ per cent interest, was oversubscribed, according to the underwriting syndicate.

F. L. Klingensmith, treasurer of the Ford Motor Co., who came here from Detroit in connection with the transaction, declared not one of the subscribing parties had asked for a statement of the company's financial condition.

Incidentally, Klingensmith denied reports variously circulated that Henry Ford had been asked to sell out to the General Motors Corp., or that he had any intention of disposing of his holdings. The Fords, he added, were in the automobile business to stay.

provements which he planned on the River Rouge, where his blast furnaces and shipbuilding plants are located. Here he had intended to center an industry with branches all over the United States and foreign lands.

Not only will the expansion project be carried out, but the proposal of Henry Ford to form a new company to manufacture a cheaper car to sell at less than \$250 came to an end with his son's acquisition of the minority stock. While wintering in Los Angeles Ford last March astonished the automobile world by announcing a plan to place such a car on the market.

Edsel B. Ford stated to-day that the designing of the new car would be continued and that if it was decided to put it in production, it would be manufactured

(Continued on page 146)

Ford Corporation Formed in Delaware

Holding Company Bears Ford Name, Capitalized at \$100,000,000—Overcomes Michigan Law

NEW YORK, July 15—Plans of Henry Ford to make his automobile manufacturing concern a \$100,000,000 corporation were brought a step toward the stage of actuality to-day, when papers were filed at Dover, Del., changing the name of the Eastern Holding Co. to the Ford Motor Co. and increasing its capitalization from \$100,000 to \$100,000,000. The assets of the Michigan Ford company will be taken over by the Delaware corporation, according to banking interests connected with the financing of Edsel B. Ford's purchase of the Ford minority stock.

The Eastern Holding Co. was incorporated by the Fords less than a week ago.

Organization of the Delaware corporation will overcome the difficulty raised by the Michigan law which limits capitalization to \$25,000,000. This provision was discovered after the Ford Motor Co. of Michigan, in June, 1915, increased its capital from \$2,000,000 to \$100,000,000, at the same time declaring a stock dividend of \$48,000,000, or 2,400 per cent on the original capitalization. Because of the law the action was rescinded.

Olds Refined Eight Has New Spring Suspension

LANSING, MICH., July 12 (Staff Correspondence) — The Olds Motor Works will have a refined eight, known as Model 45-B, for 1920. The most important change in the car is in the spring suspension, the frame horn being extended and an exceptionally long, flat rear spring provided. The wheelbase has been increased 2 in. and is now 122 in.; the radiator is larger and the frame more rigid, the latter now having a depth of 7 in. and a width of 2½ in. Increased rigidity has been gained throughout by strong fender supports, headlamp brackets, wider springs and longer spring bolts.

The steering gear parts have been considerably strengthened, a larger wheel being employed, together with larger bearing surfaces on the steering gear half nuts. A caster type of front axle with Timken bearings is used.

Other changes include the use of Spicer universals, swivel block engine mountings, a biplane type of fan, and Goodyear non-stretchable fan belt.

The body has a leather-covered bevel body rail, hand-buffed leather, improved windshield, door pockets for the side curtains, a door tool carrier, and a 20-gal. gasoline tank in place of the 14-gal. formerly used. The price of the car has been increased by \$200 and is now \$1,895.

R-34 Makes Return Trip in 75 Hours

British Dirigible Writes History
in 6000 Mile Flight with
Only One Stop

LONDON, July 13 — Bettering by thirty-three hours her cruising time on the westward journey, the British dirigible R-34 landed this morning at Pulham Aerodrome, near Norfolk, completing the first return trip by air from Europe to America.

The giant balloon, which flew from East Fortune, Scotland, to Mineola, N. Y., in 108 hours, 12 minutes, covered the eastward flight in 75 hours, 3 minutes. Favoring breezes, in place of the head winds against which the huge craft battled on the way to the United States, made possible the shortened time.

When she descended at Pulham the R-34 had flown more than 6000 miles with only one stop, establishing a record not only for lighter-than-air, but for all flying craft.

The mammoth ship came into her haven with her forward engine disabled through demolition of the crankshaft, caused by the breaking of a bolt. However, the accident was of little moment as the ship ordinarily cruises under the power of only three of her five motors.

The dirigible ran all of Friday night through a rainstorm, but her wireless worked without a hitch and the navigators kept her on a true course without difficulty. The ship maintained an average altitude during the journey of 3000 feet, arising at times to 5000 feet.

PLANES IN CONDITION

WASHINGTON, July 11—There are 2721 active planes and 2663 active engines at the various U. S. flying fields, of which 99 per cent are in serviceable condition.

TAX RULING ON PARTS

WASHINGTON, July 15—Commissioner of Internal Revenue Roper has advised the automobile trade that parts or accessories purchased prior to Feb. 25 are taxable when sold in connection with a motor truck or other motor vehicle, as provided in the revenue act of 1918. The tax does not apply to such articles purchased by the dealer from a manufacturer before the same date, and sold separately on or after Feb. 25.

TRANSCONTINENTAL TRUCK TRAIN

WASHINGTON, July 14—The transcontinental motor train left East Palestine, Ohio, this morning enroute for Wooster on the opening run of its second week on its journey to San Francisco.

During the two days' stay here the equipment was inspected thoroughly and all needed repairs and adjustments made. An officers' conference was held yesterday morning to discuss the week's trip.

day morning to discuss the week's trip.

Sunday the officers and men were entertained by Harvey M. Firestone, of the Firestone Tire & Rubber Co., at which delegations were present from Akron and other nearby towns, and addresses were made by Mr. Firestone and Col. McClure, commander of the expedition.

The train made its longest daily run on July 11 when it negotiated 81 miles from Pittsburgh to East Palestine.

Army Repair Department at Slough Well Under Way

LONDON, July 1 (*Staff Correspondence*)—Sam Wallace, an American, has brought order to the army motors repair department at Slough. His task was to organize a shop there in which army vehicles could be repaired preparatory to sale at auction.

The plant, which was uncompleted when turned over to him in May, is going at good speed and more than 800 men are at work. It is estimated that from 60,000 to 80,000 vehicles are awaiting the ministration of this shop, and that they will be turned out at the rate of 500 a month.

The Disposal Board has estimated that with an average expenditure of from \$500 to \$750 on a vehicle it can make a profit of from \$750 to \$1,000 on each.

LIQUIDATION OF ORDNANCE CONTRACTS

WASHINGTON, July 12—About \$50,000,000 worth of suspended Ordnance contracts were liquidated by the Ordnance Department Claims Board during the week ended June 21, at a rate of saving of 91 per cent, as compared with \$29,000,000 the previous week. The rate of saving on contracts previously liquidated is 81 per cent.

USE FOR SURPLUS TRAILERS

WASHINGTON, July 11—A surplus of 439 3-in. anti-aircraft trailers may be modified at a moderate cost for use as 4-ton shop trailers for 240 mm. howitzer units, according to a report by the War Department.

FOREIGN TRADE LEGISLATION

WASHINGTON, July 15—Incorporation of companies to engage in lawful business in foreign countries is authorized by a bill introduced into the House of Representatives this week. The bill carries provisions whereby corporations can be formed for entering into lawful enterprise in foreign countries or any non-contiguous territories of the United States, or any localities in which this country exercises extraterritorial jurisdiction.

Provisions are included to insure proper uses of capital stock, that the majority of directors will be citizens of the United States and that stockholders will be protected similarly to those in corporations doing business in this country.

England Scrapping New Air Machines

Engines Also Being Destroyed to
Prevent Cancellation of Con-
tracts and Unemployment

LONDON, June 24 (*Staff Correspondence*)—Considerable discussion has been aroused by the scrapping of new machines and engines, which has been going on in Great Britain.

Vast numbers of new aircraft have, immediately on completion, been sent to the Government-owned aircraft factories throughout the country to be burned and the waste thus caused has been stupendous.

The latest report of the Select Committee on National Expenditure makes a point of the fact that numbers of new aircraft were accepted from their constructors and sent straight away to these national factories to be destroyed.

The report states that following the armistice, the Air Council met and decided to inform the Ministry of Munitions that they required no more airplanes. This decision, however, was not adhered to, and in December last they wrote to the Ministry of Munitions stating that they appreciated that labor and other considerations might prevent the Ministry of Munitions from arranging a complete cessation of further deliveries, and for this reason the Air Council would accept aircraft and engines of which production is required by these considerations.

The report proceeds: "Accordingly machines were taken in large numbers from contractors, which were not wanted, and as national factories had to be kept going, it was necessary to find work for the people there, with the result that the machines taken from contractors to keep the people at the contractors' factories employed, were sent to the national factories to be destroyed, in order to keep the people at the national factories employed."

It must be remembered that England had for more than four years been working up a maximum production in airplanes. The armistice came almost as a surprise and it was utterly impossible to at once bring the wheels of production to a standstill.

SLIGHT BRITISH PRODUCTION

LONDON, July 1—British automotive factories are getting into production slowly. The Daimler factory, according to officials, has reached a production of 20 cars a week and expects to reach 50 a week during August. The difficulty appears to be to get the men to work at a satisfactory speed.

NO TIRE REDUCTION

NEW YORK, July 15—Financial journals assert that the big rubber companies have abandoned, because of high cotton prices, the second reduction in prices proposed last May.

Winton Model 25 Is Smaller Six

Made with 13 Different Bodies—
Engine Specifications and
Special Fittings

CLEVELAND, July 11 (*Staff Correspondence*)—In addition to its Model 24, 48 hp., the Winton Co. is bringing out a smaller six known as Model 25 and rated at 33 hp. The latter will be made in 13 different body styles. It will have a detachable-head, 6-cylinder engine with the cylinders in pairs, the dimensions being 3¼ by 5½ in. The engine has its combustion chambers machined all over. It has a 2¼ in. counter-weighted crankshaft mounted on four bearings. The engine is oiled by pressure feed to the main and crankpin bearings and the camshaft bearings, with a lead to the accessory driveshaft bearings. The chassis parts are also lubricated by oil.

Vacuum fuel feed is used and the inlet manifold is provided with a jacket for exhaust gases to assist vaporization. A valve is placed in the passage leading from the exhaust manifold to the jacket on the inlet manifold, for controlling the temperature of the jacket.

The Bijur two-unit starting and lighting system is employed, with the Bosch magneto for ignition. The clutch is a dry plate, multiple disk, and the gearset provides four forward speeds. The chassis is mounted on semi-elliptic springs and the frame is of channel sections without offset in the side rails. A torsion rod is fitted, this being a nickel-steel, V-shaped structure. The axles are Timken, with Timken roller bearings throughout. Timken bearings are also employed in the wheels. The tires are cord, straight side, 35 by 5 in., mounted on Firestone rims. Among the fittings is a combined electric lighting and ignition switch with Yale lock, a Warner 100,000-mile speedometer, Waltham clock, with a small tool compartment under the cowl. There are double head lamps and single tail lamp.

The wheelbase is 132 in. and the clearance 9½ in. The bodies offered and their prices are as follows:

Touring cars:	
4-passenger, Sport	\$3,600
5-passenger	3,600
6-passenger	3,600
7-passenger	3,600
Roadsters:	
2-passenger	3,600
3-passenger	3,600
Closed cars:	
Victoria, 4-passenger	4,500
Sedan, 4-passenger, Sport	4,700
Sedan, 7-passenger, four-door	4,800
Limousine, French, town car	4,550
Limousine, three-quarter, 7-passenger	4,550
Limousine, four-door, 7-passenger	4,800
Limousine-Landaulet, 7-passenger	4,800
Chassis only	3,265

MAXWELL-CHALMERS ORDERS

CHICAGO, July 12—The Maxwell-Chalmers Motor Co. is reported to have orders for 27,000 Maxwell cars and 7000 Chalmers, its daily output averaging 200 Maxwell and 60 Chalmers.

There is \$17,000,000 due the two companies by the government, which will

leave them \$4,000,000 working capital, after taking care of current indebtedness amounting to \$6,000,000 and deducting government material on hand to the amount of \$7,000,000.

The Maxwell and Chalmers companies after merging contemplate an issue of \$10,000 notes, which will provide funds until the settlement of \$10,000,000 by the government, after which the notes will be retired.—Copied from *Tribune*.

Bergougnan Tires Placed in Production in America

NEW YORK, July 15—The Etablissements Bergougnan, one of the world's largest tire producers, has announced the opening of an American factory at Trenton, N. J., where pneumatic tires are already in production and plans are in the making for turning out solid tires.

The Bergougnan company, its main plant at Clermont-Ferrand, France, where 6000 persons are employed, also manufactures tires in Italy and Russia. The founder of the concern, Raymond Bergougnan, gave valuable assistance to the French government by working out a system of supplying tires for the army transport division.

The American company, known as the Bergougnan Rubber Corp., and headed by H. H. Coleman, with Jean Grenier as vice-president and secretary, has taken over the former Delion factory at Trenton, where 500 tires a day are being produced. These include both tires and tubes for passenger cars, manufactured according to French methods. The demand from American customers could not be met, according to Grenier, by importations from France. Making of solid truck tires, he added, would be undertaken soon, together with an expansion of the plant's operations to double the present capacity.

Bergougnan has been manufacturing tires since 1889. Its pneumatic product is of the rat tread type. Its solid tires are in use in many countries.

ADMIT PETROLEUM FREE

WASHINGTON, July 11—Under new customs tariff petroleum is admitted free into Guatemala.

Goodyear California Plant to Be Completed This Year

AKRON, OHIO, July 12—Ground will be broken this week for a \$26,000,000 rubber and cotton plant for the Goodyear Tire & Rubber plant at Ascot Park, Cal. A plot covering 550 acres will be developed with tire and cotton plants. The plant, which is to employ about 3500 men, is to be completed this year.

The first building will employ 3000 men and will turn out an equal number of tires each day. As soon as tire production is taken care of the company expects to erect a cotton factory which will draw its raw material from the cotton fields of Imperial Valley and the Salt River in Arizona. Provision for housing workmen will be another feature of the project.

NEW OVERLAND 4

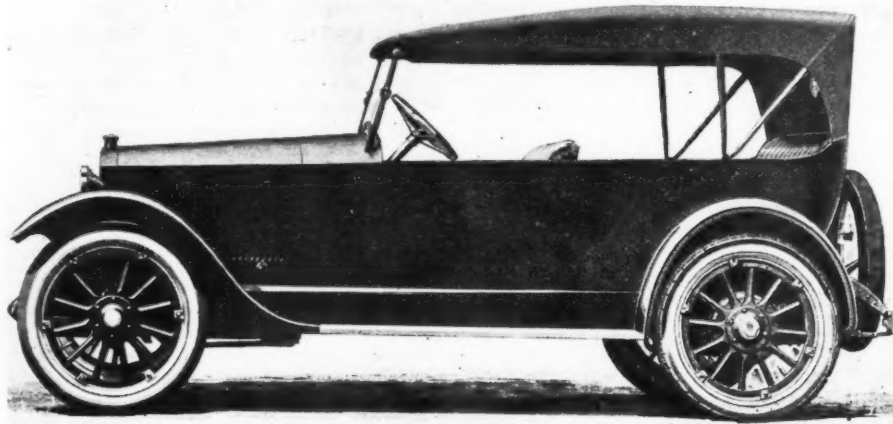
TOLEDO, July 11—The coming week will also see the new Overland Model 4 on the market. This car is now in production. The price will be announced later.

New Cleveland Car Is Priced at \$1365

CLEVELAND, July 14—Production of the new Cleveland car, made by the Cleveland Automobile Co., with its overhead-valve six, will begin in about 3 weeks. A schedule of 5000 up to Jan. 1 has been tentatively arranged, and this will increase to bring the total production up to 20,000 for the first year. A price of \$1,365 has been set for the touring car and roadster, which will be in production first. A line of closed bodies will be made later.

The engine and axles are Cleveland design and manufacture, with practically all the other units of standard parts. Block cast 3 by 4½ in. cylinders with a detachable head carrying the entire overhead valve assembly are employed.

Conventional practice is followed in the general layout. The wheelbase is 112 in., the tire size 32 by 4 in. on wood wheels with demountable rims.



New Cleveland model announced by Cleveland Automobile Co.

English Car Production Suffering from Slow Strike

LONDON, ENGLAND, July 5 (*Staff Correspondence*)—The impossibility of speeding up production in automotive factories is still the outstanding factor in connection with the industry in Great Britain. It seems impossible to persuade the workers to make a special effort and to-day very few factories are supplied with intelligent crews of workmen for double shift work.

The demands of labor for shorter hours, higher pay, and the consequent lower production can have but one result: that the increased cost of production will be added to the final cost, and many of the markets that Great Britain enjoyed previous to the war may be lost.

With many of the workmen there seems to be a sub-conscious feeling that they have earned eternal immunity because of the work they did in the war and do not seem desirous of entering into permanent work, as it was expected they would. Employers have come to call this the "Slow Strike."

International-Wright Merger Gets Approval

NEW YORK, July 15—Directors of the International Motor Truck Corp. and the Wright-Martin Aircraft Corp. have approved the plans for a merger of the two companies, which will be carried out by a committee of leading shareholders of both concerns.

Wright-Martin preferred shareholders, under the plan, will receive \$120 par value of International Motor first preferred for each of their present shares and accumulated dividends. Wright-Martin common holders will receive for each 100 shares 2.8 shares of second preferred and two shares of common stock of the International Motor along with twenty-five shares of no par value stock of the new Wright-Martin company, which will conduct the aircraft business.

International Motor will increase its capital for this purpose. There will be no change in the common shares of International Motor. Both first and second preferred shareholders of International Motor will retain their present holdings and receive in addition the amount of their accumulated dividends in the same class of stock as now held at par.

127 ROAMERS IN JUNE

KALAMAZOO, MICH., July 11—In June the Barley Motor Car Co. manufactured 127 cars, its largest month's output. The plans for July and August are 200 cars each month.

SAMSON BUILDING ADDITIONS

JANESVILLE, WIS., July 14—The Samson Tractor Co., member of the General Motors group, will have a complete foundry unit, 300 x 500 ft., built, and also a steam generating plant and boiler house. The first unit was completed

early in March, and the second unit of equal size will be ready to-morrow, when ground will be broken for the casting plant.

A. D. King, Flint, Mich., has assumed general charge of the Samson operation as factory manager. He comes from the Chevrolet division of the General Motors organization. His first entry into the automotive industries was with the old Leland-Falkner Co., now the Cadillac. He later spent six years with Ford and then went to Maxwell as general superintendent. Three years ago he became motor production manager of Chevrolet.

Fordson Factory at Cork Starts Production July 4

LONDON, June 30 (*Staff Correspondence*)—Sir Percival Perry, K. B. E., and R. D. Woodhead, directors of the British Fordson tractor interests, have been elected members of the Cork Harbor Board.

It was stated that the first Fordson tractor was expected to be ready on July 4, to be followed by ten more within the same week. Commencing to-day the Cork Fordson factory hands will work on a 44-hr. week, and the rates of pay will be as follows: Men over 18, 34 cents per hr., and 6 cents per hr. share of profits, total 40 cents per hr.; boys under 18, wages 12 cents per hr. and no share of profits.

The same hours and conditions will apply to the office staff. Women workers over 18 will receive 24 cents per hr. and a profit sharing rate of 6 cents per hr.; and girls under 18, 12 cents an hour and no share of profits. It is stated that the profit sharing is a gratuity, conditional on good conduct, and may be withdrawn at the company's discretion.

NEW KING-8

DETROIT, July 14—The new King-8 is now in production. It is the first model of the King post-war series. The car is especially geared with a ratio of 4 to 1. While the chassis is of the standard King roadster type the body is made of aluminum and is finished either in Scout khaki or coach painters' carmine. The upholstery is of Spanish leather. The car retails at \$2,550.

ESSEX ROADSTER

DETROIT, July 11—In addition to its touring car, the Essex Co. is mounting a roadster on the same chassis. The car is finished in the same green as the Essex touring car, with black wheels and will sell for \$1,595.

NORDYKE-MARMON FINANCING

NEW YORK, July 14—The Nordyke & Marmon Co.'s expansion project, by which more than 300,000 sq. ft. of floor space will be added to the plant at Indianapolis and the production doubled, is being financed by a 1- to 10-year serial note issue for \$2,500,000, rather than a bond issue as previously announced.

Cowles is Engineer Of Stevens-Duryea

Will Direct Manufacture in Former Factory—Deering Heads New Company

CHICOPEE FALLS, MASS., July 15—The Stevens-Duryea Co., reorganized with Ray S. Deering as president and Thomas L. Cowles as chief engineer, will shortly commence manufacture of a new type, high-grade car bearing the company's name. The concern has taken the old Stevens-Duryea factory, utilized during the war by the Westinghouse Electric Co.

While the firm's policies have not been fully formulated, the managing organization has been completed, and a definite announcement of the type of car to be produced will be made shortly.

William Remington, who handled parts of the old Stevens-Duryea car, will be consulting engineer. Other officers, aside from Deering and Cowles, are: Vice-president, Earl Palmer; secretary and treasurer, M. R. Leathers; clerk, William S. Fish.

Peerless Control Back to Cleveland

CLEVELAND, July 14—Ownership of 75 per cent of the stocks and control of the Peerless Truck & Motor Corp. returned to Cleveland when new directors and officers were elected. Cleveland now has ten directors and New York three.

B. G. Tremaine, of the National Electric Lamp Co., is president of the Peerless Truck & Motor Corp. Other officers are: Vice-president, F. S. Terry, of the National Electric Lamp Co.; vice-president and general manager, T. W. Frech, of this city; treasurer and attorney, H. A. Tremaine; secretary, George B. Siddall.

These five officers with Lyman H. Treadway, president of the Peck, Stow, Wilcox Co., and a director of the Federal Reserve bank; Walter C. Baker, former president of the American Ball Bearing Co.; Roland T. Meacham, investment banker who has been active in handling Peerless securities; Mr. Siddall, and William Starring, all of Cleveland, are on the new board of directors. The New York men who will continue on the directorate are Harrison Williams, who was president of the corporation; E. W. Harden and William E. S. Griswold. Mr. Harden is the Rockefeller representative on the board, and Mr. Griswold represents the National City Bank.

Business of a satisfactory nature is reported at the Peerless plant. About 5000 passenger cars are to be made this season, it is said, although plans are being developed for a much larger capacity next year. This year's output will consist of 60 per cent open and 40 per cent closed cars. Alterations in the factory costing \$130,000 are under way to enlarge the body building department.

Parrett Test Is Big Feature of Wichita Exhibit

Makers Generally Express Dissatisfaction with Short, Non-Record Plowing Show

Toastmaster for S. A. E. Dinner Arrives by Airplane—300 Tickets Disposed of

By DAVID BEECROFT

WICHITA, KAN., July 16—The first three of the five days of the National Tractor Demonstrations held nine miles from here have developed nothing radically new and, as day follows day, the impression gains that nothing is coming out of the demonstration more than a getting together of the makers. Practically all of the tractors are here with exception of the Samson, built by General Motors.

Daily Program

The daily program of plowing is too short to give opportunity to study the seventy or more tractors demonstrating. To-day plowing started at 1.15 p. m. and in less than half an hour some machines had plowed their allotment and were heading back for the tented city where each of the tractor makers has a tent for exhibition purposes.

Other tractors had nearly two hours work, but that is too short to give opportunity of studying the work of the different machines and making necessary comparisons.

You hear constant reference to the recent Denver demonstrations where plowing started at noon and continued without pause for five or nearly six hours. Such a test proves real stamina of machines and gives spectators a chance to look over a goodly portion of entrants.

Plowing Time Short

As no records of any character are taken here there are no results to be given out, so the spectator simply sees a tractor plowing and does not know the speed at which it is working or anything else. There is no data being collected. The tractors all start together at a white flag signal and stop when their plot is finished. While plowing is going on, other tractors are drawing combinations of discs, harrows and other tillage tools.

Attendance to-day was much better than yesterday, but not in any sense commensurate with the magnitude of the show that the makers are staging. It is really a local affair.

Practically all of the tractors perform their allotted plowing task entirely satisfactory, not having to make stops except in rare instances and then, unless you happen to be nearby, there is no possibility of finding what the trouble is.

Yesterday the Uncle Sam was elim-

inated by an accident in which the brace rods to the front axle broke which, in turn, resulted in the trunnion support of the engine on the axle breaking. There are a few cases of bad carburetion, with stops of three or four minutes, but no records are taken of such. More radiators are steaming than a year ago, but these are generally with new machines that have not been worked in. Plows cause more delay than tractors, due to clogging of the long straw.

More Controlled Implements

There is a big increase in the closer combining of the tractor with the implement. To-day a Case machine was cutting hay with the operator seated on the mowing machine and controlling the tractor by extension controls, which work with admirable satisfaction. There are always half a dozen other different kinds of farm implements being demonstrated with the operator sitting on the implement and controlling the tractor through extension controls. The one man idea of running the tractor and the implement has gained very materially and in a year or so will be universal. The scarcity of farm help demands it.

Parrett Test Near End

The Parrett demonstration of cutting, threshing and then plowing a 127 acre field of wheat will be completed by noon Thursday, July 17. The work started on June 26, but there have been many delays due to rains. This afternoon the tractor was averaging a little over 2¼ miles per hour and has been plowing night and day since it started on the big task. It has had few stops other than cleaning magneto points, repairing fan belts and a few other incidentals. The test is the talking point in Wichita this week.

The S. A. E. Dinner

The annual tractor dinner to-morrow night of the Society of Automotive Engineers will be the biggest function of the week. More than 300 tickets have been sold. Past President C. F. Kettering, who will be toastmaster, arrived this evening by airplane from Dayton, having covered the 800 miles in a De Havilland four in seven hours. He was piloted by Rheinhardt and made the trip without having to make any intermediate landing.

Kettering will be assisted by an aggregation of good speakers, including the Governor of Kansas.

Two Price Reductions

Very few announcements with regard to future policies in the tractor industry have been announced this week. Avery has announced reductions on two models which, following a reduction on the Titan, has created a little concern among many makers that think this is no time to reduce prices. Materials are too high and service requirements too urgent. It is not the consensus of opinion that many price reductions will be made.

The tractor management has had a thorn in its side this week with the Pan tractor from Saint Cloud, Minn. It ap-

Price Reductions on Tractors Few

Manufacturers Declare Material and Labor Costs Prohibit Decreases—Increases Likely

WICHITA, KAN., July 16 (*Staff Correspondence*)—Though representative leaders in the tractor manufacturing field advised AUTOMOTIVE INDUSTRIES to-day that no general decrease in selling prices could be expected, owing to high material and labor costs, three companies—International Harvester, Avery and Beere—announced reductions.

Avery announced a price drop, effective at once, on model 1235 from \$1,270 to \$1,000 and model 816 from \$925 to \$700. All other models remain unchanged.

The International Harvester's reduction on Titan model 1220 is from \$1,225 to \$1,000, and De Beere & Co. offer the Waterloo Boy at \$100 below the former figure.

Advances Likely

The reasons for these reductions, it was explained, are not applicable to the trade in general, regarding which C. J. Gittins of the J. I. Case Threshing Machine Co., chairman of the demonstration committee of the National Implement Vehicle Association, C. S. Brantingham, president of the Emerson, Brantingham Co., and Finley P. Mount, president of the Advance Rumely Co., the latter two also members of the committee, united in the following statement:

"In the face of the present material and labor costs, and the trend of prices of automobiles, agricultural implements and other machinery, no general decrease in the selling price of tractors seems possible at present."

In fact, several companies have announced their intention of advancing prices in the near future.

plied for permission to exhibit and paid the necessary deposits. Later the management decided not to permit the exhibit to remain and gave orders to move out at the end of the first day. The Pan officials retaliated by obtaining a court injunction which resulted in their having the tractor in the plowing demonstrations to-day. The case is not yet settled.

Winter Show

The winter tractor show will be held in Kansas City late in January or early in February; the date is not yet fixed. There is considerable talk of Chicago as the logical place for the winter tractor show because of the hotel accommodations necessary and also because Chicago is nearer the manufacturing center of the country. Accessory and parts makers are very much in favor of the winter tractor show and feel they are getting better treatment at it than they do at either the New York or Chicago automobile shows.

French Automobile Factory Strike Ends

**Men, Involved in Sympathetic
Walkout, Back on Old Con-
ditions—8-Hour Day
a Problem**

PARIS, July 5 (Staff Correspondence)—After being closed for a month, the French automobile factories resumed work this week.

So far as the car factories are concerned, there appears to have been very little justification for the strike. The general engineering trade was dissatisfied with the method of application of the 8-hour day and with various details regarding pay. The great majority of the men in the automobile factories, however, were satisfied with their working conditions, but allowed themselves to be involved in the strike movement, with the result that every automobile factory in Paris had to be closed.

There were a few disturbances, notably at the Renault factory, where one striker was accidentally killed, and where a foreman was thrown into the Seine and drowned.

The Dunlop Tire Factory endeavored to continue work, but the strikers got in and started rioting, with the result that one man was severely injured. In view of this turn of events, the Goodrich factory was closed.

When the men returned to work another union threatened to bring out the firemen, which would have entailed another shut-down of the factory. By diplomatic treatment the union was persuaded to leave these men at work, and production has been resumed in this factory.

On the whole, the men in the automobile factories have returned to work on the same conditions as before the strike. The strikers made a claim for forty-eight hours a week, which had been granted in every case, and for the minimum wage for skilled workers of \$30 per week. This minimum wage had been granted in the great majority of cases, and where disputes existed it would have been possible to settle them amicably.

Many of the workers admit that they only came out under the threat from the strikers. Because of this they are claiming that they should be paid for the time the factory was closed. Owners, however, have strongly refused to admit this. They state that if their workers had possessed any grit they could have remained at work despite the threats of the strike leaders. In consequence the men who allowed themselves to be drawn into the movement must forfeit their wages for the time lost.

The application of the 8-hour day in France is involving important social changes. It has been recognized by the men themselves that they must speed up as the result of the reduction of the number of hours. Some of the factories have decided to work in a single shift

of eight hours with a break of half an hour for a light meal to be taken in the shops. The first to do this was the Gnome & Le Rhone Co.

After six months' experience, the factory heads state they are thoroughly satisfied with this experiment. The men start work at 7 o'clock in the morning and leave at 3.30 in the afternoon. There is a break of half an hour at midday for a light meal, but the men do not leave the shops during this time, and the half hour lost is paid for in full. The men work eight hours, but are paid for eight and a half hours.

It is the French habit to eat a very light meal in the morning, to partake of a heavy meal at midday, and another heavy meal at night. Under this system of working eight hours, the heavy midday meal has to be foregone.

In some cases the factory heads are looking after their men. The Goodrich Co., for instance, has bought a Y. M. C. A. canteen and has erected it inside the factory yard. The men can come here at lunch time and buy a light meal to be consumed on the premises.

In Italy the experiment of an 8-hour shift has met with only partial success; French firms which have tried it seem to be thoroughly satisfied. The Gnome Co., for instance, stated that this system is satisfactory to everybody, and that the men save both time and money.

Government Monopoly for French Oil Trade

PARIS, June 28—The French Government is about to establish a monopoly for the purchase and importation of refined oils and gasoline. It is estimated that this monopoly will result in an income to the State of \$7,000,000 a year. Details of the scheme have not yet been issued.

At the beginning of the war the French oil importers were under a contract to supply determined quantities of kerosene and gasoline to the army and civilians. When these contracts were not fulfilled, the government stepped in and adopted a practical monopoly for the purchase abroad and the importation into France of kerosene and gasoline.

Briefly, the proposed scheme is a continuation of this plan under the control of a department of the Ministry of Finance. The refinery of oils in France and sale in France would be left to private enterprises with state participation in the profits.

Ten of the most important gasoline refiners in France have formed a joint stock company with a capital of \$6,000,000 in 30,000 shares of \$200 each.

BELGIUM TO HAVE SHOW

BRUSSELS, June 28—The Belgian automobile show will open on Dec. 13, in the Palais du Cinquantenaire. Brussels will follow the Paris and London shows. The hall, in one of the best suburbs of Brussels, was used during the war by the German forces as a central automobile depot.

Tractors to Compete at French Exhibit

**Fall Show at Senlis to Abandon
Non-competitive Demonstra-
tions as Ineffective**

PARIS, June 28 (Staff Correspondence)—Realizing that agricultural tractor demonstrations of a non-competitive nature are useless both to the farmer and the manufacturer, the French Society of Tractor Manufacturers announces that its next competition, to be held Sept. 29 to Oct. 5, will be of a semi-competitive nature.

The exhibit is booked for the neighborhood of Senlis (Oise), this district having been chosen because it is in the devastated area, where there is greatest need of tractors and modern agricultural implements.

The competition is of an international nature, foreign machines being received on the same footing as those of French construction. Entries open Aug. 1 and close Aug. 14. No manufacturer can enter more than two machines of any one type, or six in all, in the three classes specified under the rules, as follows: Tractors hauling usual type of plow, self-contained machines and special machines for small cultivation, such as vineyard, vegetable gardens.

During the first three days of the competition, elimination tests will be held, and any machine which is unable to fulfil the minimum conditions laid down will be called upon to withdraw from the demonstration. These preliminary tests are four in number:

Plowing 478 sq. yd. per hp. to an average depth of more than 10 in.

Plowing 598 sq. yd. per hp. to an average depth of 8.6 in.

Plowing 837 sq. yd. per hp. to an average depth of 7 in.

Plowing 1794 sq. yd. per hp. to an average depth of 3.1 in.

Owing to the absence of a recognized type of recording dynamometer giving the actual drawbar pull, and owing to the non-existence of a standardized type of plow, there will be no real competition with awards in the order of merit. Instead, an official report will be prepared on the work done by all machines which have passed these four preliminary tests. This report will state the actual amount of ground cultivated, the quantity of fuel consumed, and will give the dimensions of the engine and weight of the tractor.

A special class is prepared for experimental machines which are not yet in production. These machines are received free of any entry fee and will work without any official control, the only condition being that they shall remain on the ground during the entire demonstration.

CLEVELAND PRICE \$1,385

The price of the new Cleveland car, listed on page 136 as \$1,365, should have read \$1,385.

June Air Mail Record 99 Per Cent Perfect Cleveland-Chicago Division 100 Per Cent—Ten Planes in Flight on July 4

WASHINGTON, July 12—A record of 99 per cent was made by the Air Mail Service between Washington and New York for June, covering a mileage of 11,118 and carrying 15,643 lb. of mail.

On the Cleveland-Chicago division a perfect score of 100 per cent was obtained. A total of 19,825 miles was run during June, and a total of 19,603 lb. of mail was carried. The average speed on that route for the month was 97.8 m.p.h. The best flying was performed on June 18, when the round trip from Cleveland to Chicago and return was made in 6 hours and 14 min., an average of 104.4 m.p.h. in each direction.

The operation of the Cleveland-Chicago route is without a parallel in the history of aviation. The route was started May 15 and has never missed a day, 70 consecutive daily non-stop flights of 325 miles each were made without a forced landing. On the 71st trip a gas line connection sprung a leak, causing a forced landing on the emergency air mail landing field at Bryan, Ohio.

The route from New York to Cleveland, across the Allegheny mountains, has been operating with the same degree of perfection as the Cleveland-Chicago route since July 1.

On July 4 there were ten planes in flight on the mail route between Washington and New York, New York and Cleveland, and Cleveland and Chicago. The shortest route was 215 miles from New York to Bellefonte, Pa., and the longest route was from Cleveland to Chicago, or 325 miles. All ten planes scored 100 per cent, arriving and leaving every station on time.

REVIVE ASTOR CUP RACES?

NEW YORK, July 16—Racing men here are discussing a proposal for revival of the Astor Cup races, with the first contest at the Sheepshead Bay Speedway, Sept. 20. If the project is carried out, A. A. A. contest officials declare that a 200 or 250-mile race will be held, with a purse aggregating \$25,000. The Astor Cup was last won by the Stutz team.

ENGLISH AERIAL DERBY

LONDON, ENGLAND, June 24 (Staff Correspondence)—Between three and four million persons are estimated to have watched the progress of the Aerial Derby last Saturday, the first held since July, 1914. This year each competitor was forced to fly twice over the course, a circle around the city of London. The course was the same as that of the before-the-war aerial Derbies, and was selected so that the greatest number of persons could witness the race.

AMSTERDAM AERONAUTICAL EXPOSITION

WASHINGTON, July 14—The first aeronautical exposition, which was to have been held at Amsterdam, Holland, this month, has been postponed to Aug. 1. It will continue into September. Applications for space for exhibits can be made to the General Secretary of the First Aircraft Exhibition, Amsterdam.

The exhibition will be held under the direction of the Amsterdam and Rotterdam Chambers of Commerce, and will be divided into fifteen sections: historical groups, airplanes, hydroplanes, engines, automobiles, motorcycles, tools and construction, photography and maps, telegraphy, telephony, lighting, instruments, meteorology, model airplanes, medical department, equipment and scientific.

England-Australia Flight Competition for \$50,000

LONDON, June 24 (Staff Correspondence)—The Commonwealth Government of Australia has offered a prize of \$50,000 for a flight from England to Australia. The competition is not to open until after Sept. 8.

Conditions are as follows:

- (1) All machines entered must have a flying radius of at least 500 miles.
- (2) All machines must carry a competent navigator, who need not necessarily be certified.
- (3) Proper provision is to be made for the supply of spare parts over the route, and their carriage when necessary.
- (4) Satisfactory proofs that properly marked landing places are available, and the necessary stores, petrol, etc., have been provided.

30 Fliers Graduated by Air Service Weekly

WASHINGTON, July 12—The Air Service graduated 30 fliers per week during the month of June. The average attendance at the flying schools was 83 per week in the same month, and the average number of hours flown per man in training totaled 7.22, shown in the following table:

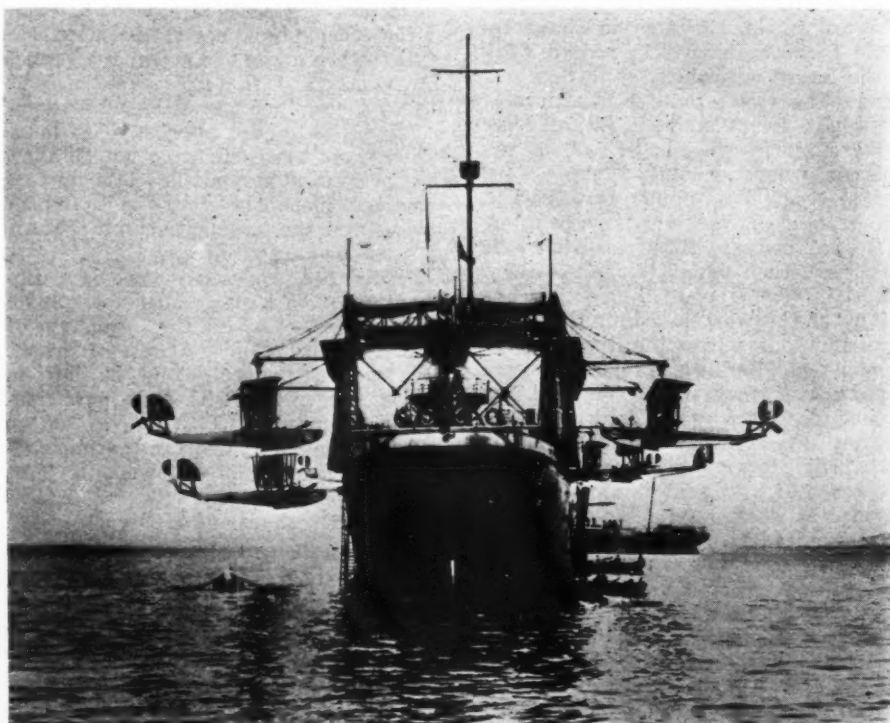
	Attendance	Graduation	Hours Flown Per Man in Training
Week ended Nov. 11...	2,423	208	5.71
Weekly avge. Jan.-Feb. 1, 240		35	2.19
Weekly avge. Mar.-Apr. 905		53	3.25
Weekly avge. May.....	361	103	6.72
Weekly avge. June.....	83	30	7.22

AVIATION IN SOUTH AFRICA

LONDON, June 24—A commercial aviation company has been formed in South Africa for promoting aerial services between Johannesburg and Pretoria, and also between Johannesburg, Maritzburg and Durban. Flying demonstrations will be given, familiarizing the public with this new development of civil transport.

ENGINE BUILDING

SPRINGFIELD, ILL., July 15—The Racine-Sattley Co. has broken ground for the erection of a building for the construction of gasoline engines, in which 600 men will be given employment. The building is expected to be ready for occupancy by Jan. 1.



Mother ship Europa of the Italian Naval Air Service. Four seaplanes may be seen hanging from their davits

Standard Farm Light Ratings Established

Electric Plant Manufacturers Adopt S. A. E. Intermittent Time Test

CHICAGO, July 14 (*Staff Correspondence*)—The question of rating farm light batteries was decided at a meeting of the Isolated Electric Plant Manufacturers section of the National Gas Engine Association on Thursday. The rating adopted is the 72-hr. intermittent elapsed time test proposed at the national meeting of the S. A. E. at Ottawa Beach, and which is now in the final stages of being accepted.

In the event that the standard S. A. E. intermittent test, now completed and awaiting distribution to the manufacturers, should not be accepted by all manufacturers, provision was made for the adoption of any other standard that the S. A. E. may propose.

During the meeting, the question of the proper status and relation of the interested parts manufacturer to the Isolated Electric Plant Mfg. section was discussed. It was not thought advisable that the parts manufacturer should be given a voting right in the proceedings of the organization.

As finally proposed by R. H. Grant, of the Domestic Engineering Co., chairman of the reporting committee, the status of everyone with relation to the organization was to be as follows: "Manufacturers of complete and partially complete plants were eligible to membership in the organization, with a voting power. Parts manufacturers were also eligible to membership, but were not to have the power to vote." Further action on this question will be taken at the next meeting.

Henry Kennedy of Lalley Light Corp., spoke on "Service to be given by the Manufacturer, Distributer and Dealer." The 90-day guarantee was urged in favor of the one year or more blanket guarantee, which had been given in the past.

STEEL COMPANIES MERGE

CLEVELAND, July 14 (*Staff Correspondence*)—The Otis Steel Co. and the Cleveland Furnace Co. have been merged. The controlling interests of the Otis Steel Co. was purchased from British owners last May by William Salomon & Co., bankers of New York City. The merger was contemplated in connection with that purchase, but all the details of the deal were not worked out until this week.

The capital stock of the new company, which will be called the Otis Steel Co., will consist of \$4,850,000 of 7 per cent cumulative preferred shares having a par value of \$100, and 411,688 shares of common stock with no par value.

The company now proposes to retire its existing \$2,373,500 par value outstanding preferred stock; to create a

new issue of preferred stock; to readjust the outstanding common stock, and to enlarge its manufacturing facilities by acquiring the assets and business of the Cleveland Furnace Co., which was organized in 1902.

The consolidation will add facilities of the Cleveland Furnace Co. for making pig iron, to the plants of the Otis Steel Co., in making finished steel products. The properties of the two companies adjoin each other.

Screw Thread Commission On Its Way to France

NEW YORK, July 15—The National Screw Thread Commission, which is going abroad to study European thread standards, sailed July 13 for Brest on the Leviathan.

Headed by Dr. S. W. Stratton, director of the United States Bureau of Standards, the American experts will meet French engineers in Paris, thence proceeding to London, where an informal conference will be held with the British Engineering Standards Association. It is expected that a tentative agreement will be reached with the British on pipe thread standards.

Aside from Dr. Stratton, members of the mission are: Vice-chairman, Lieut. Col. E. C. Peck; Capt. John O. Johnson, representing the army; Commander L. B. McBride, who is attached to the American Embassy in London, representing the navy; H. L. Horning of the Waukesha Motor Co., and Earle Buckingham of the Pratt & Whitney Co., representing the Society of Automotive Engineers, the former going as alternate for E. H. Ehrman of the Chicago Screw Co. and the latter for H. T. Herr of the Westinghouse Electric & Mfg. Co.; F. O. Wells and Luther D. Burlingame, representing the American Society of Mechanical Engineers; Lieut. Robert Lacy and H. W. Bearce, technical secretaries.

SHIP BY MAIL

WASHINGTON, July 11—Shipments can be made by mail of parcels valued at less than \$200 to any country in the Western hemisphere or Africa; any country in Asia except Arabia and Turkey, and the following countries in Europe: Great Britain, France, Italy, Belgium, Greece, Spain and Portugal, their colonies, possessions and protectorates; also Iceland, the Faroe Islands, Norway, Denmark, Sweden and Roumania. Shipments can be made without limit of value to Canada and Newfoundland.

It is not necessary to make application for license nor present a license of any kind to the postmasters and all local postmasters have been authorized to accept shipments as described above. Packages should be marked, "Ship under export license R. A. C.-52," and should contain a list of contents, name and address of the shipper and name and address of the consignee. These rulings were issued by the War Trade Board Section of the Department of State.

Report on Alcohol For Fuel Issued

British Inter-Department Committee Makes Recommendations to Government

LONDON, June 30 (*Staff Correspondence*)—The report of the Inter-Departmental Committee on the utilization of alcohol for power and traction purposes, over which the late Sir Boverton Redwood presided, is issued to-day. The committee make the following general recommendations:

"We are of opinion that the time has come for action by the Government to insure close investigation of the questions of production and utilization, in all their branches, of alcohol for power and traction purposes.

"In the British Empire there are vast existing and prospective sources of alcohol in the vegetable world, although in the United Kingdom itself production from these sources is now, and is likely to remain, small; but synthetic production in this country in considerable quantities, especially from coal and coke over gases, is promising.

"As the price of alcohol for power and traction purposes, to which we propose the name of 'power alcohol' should be given, must be such as to enable it to compete with petrol, it is essential that all restrictions concerning its manufacture, storage, transport and distribution should be removed as far as possible, consistent with safeguarding the revenue and preventing improper use, and that cheap re-naturing should be facilitated.

"We recommend that an organization should be established by the Government to initiate and supervise experimental and practical development work at home and overseas on the production and utilization of power alcohol, and to report from time to time for public information all scientific, technical and economic problems connected therewith.

"This organization should be permanent, should have at its disposal the funds necessary for its investigations, should be in close relation with the various governments of the Empire, and should be so constituted as to be able to deal with alcohol in conjunction with other fuels which are or may become available as a source of power."

The committee emphasizes the necessity of taking steps in advance to meet the time when any acute recurrences of high prices for motor fuels might arise. The report contains nothing new concerning the high prices affecting kerosene and gasoline.

COLE ADDITION READY

CHICAGO, July 14—The Cole Storage Battery Co. has completed its addition giving 14,000 sq. ft. of additional floor space. Ground has been purchased for further expansion. The new factory is at 2435-41 Indiana Avenue. General offices will remain at the present address until the new building is completed.

No Ban Now on Car Imports in France

Elimination of Obscurity Shows High Duties Only Bar to Sales

PARIS, July 4—(Staff Correspondent) —It is now clear that all kinds of automobiles can be imported into France. Touring cars pay a 70 per cent ad valorem duty. Trucks weighing not less than 5511 lb. pay the same duties as before the war, plus an ad valorem tax of 20 or 10 per cent. As American trucks come in under the preferential tariff they will have to pay 50 francs per 100 kilos, plus 10 per cent on their value.

The decree issued a few days ago was so obscure that it has been very difficult to obtain an exact understanding of the situation. There appears to be no doubt now that the above interpretation is correct.

The official explanation of the adoption of a temporary ad valorem tax on practically all goods is that the French duties before the war were mostly based on weight. As the value of all material has considerably increased during the last five years, these duties have become insufficient.

For instance, goods which in 1914 were worth \$4 a kilo, in many cases are now worth \$10, and it is in order to cover this difference that the ad valorem tax has been established.

It is difficult to understand why touring cars have been picked out for special treatment. They are not on the list of prohibited articles, nor do they figure on the list of articles which can be brought in at the old rates, plus the new ad valorem taxes.

It is because of this that confusion has arisen, some persons arguing that as they were not prohibited they were free to be imported on the pre-war basis, while others believed that the temporary 70 per cent duty instituted during the war still remained in force. It has now been declared that this latter interpretation is the correct one.

While a 70 per cent duty in normal times would be absolutely prohibitive, the demand for cars now is so great that some will be sold despite this duty if quick delivery can be made.

It is evident that as soon as the French factories get into production, which is expected to be toward the end of the year, it will be impossible to sell foreign cars in France on a 70 per cent import duty. The general impression is, however, that the duty will be reduced when the home factories are in a position to meet local requirements.

At the present time new French cars are being sold by dealers at an increase of 15 to 30 per cent on the makers' catalog prices. Cars are so rare that clients are willing to pay this extra price.

WASHINGTON, July 16—The Bureau of Foreign and Domestic Commerce has no interpretation of the French tariff

that differentiates between cars and trucks. The reading of the act here makes the weight distinction apply alike to cars and trucks. There are other details of the tariff decree which are not clear to Washington officials, who were glad to hear that there was also some doubt in France as to what was meant.

According to the reading here, the tariff on agricultural tractors includes the normal duty of 15 francs per 100 kilos, plus a new surtax of 20 per cent ad valorem. The duty on all other tractors is 15 francs per 100 kilos plus the new surtax of 10 per cent on the value. The duty on parts for automobiles and trucks, not including tires, continues at 70 per cent ad valorem. Automobile tire tariffs are in doubt due to the new surtax imposed of 10 per cent.

France passed a law last year making a tariff of 70 per cent on automobile tires. The new text does not state whether the surtax of 10 per cent is to be added to the 70 per cent or whether the 70 per cent tax is repealed and the 10 per cent ad valorem surtax is to be added to the pre-war tariff, which was 150 francs per 100 kilos. The bureau has cabled for clear information on this subject.

The tariff on motorcycles now carries a surtax and is 250 francs per 100 kilos, plus the new surtax of 15 per cent ad valorem.

New Pierce-Arrows Sell For \$11,000 in France

PARIS, June 28—More than \$11,000 each is the price obtained for two 6-cylinder Pierce-Arrow limousines sold to-day by option at the military grounds in Paris.

These cars formed part of the batch of fifty intended for the Peace Conference. For some unexplained reason, they were not required and were put up for sale in new condition. The first to be sold realized 56,603 francs, which is equivalent at nominal rates of exchange to \$11,320. The second, and similar car realized 55,559 francs, being equal to \$11,112.

NEW FACTORY FOR VIM

SCHLEISINGERVILLE, WIS., July 14—The Vim Tractor Co., a reorganization of the Standard Machinery Co., has purchased seven acres of land adjacent to the present factory and will erect the first of a series of additions. Negotiations are being concluded for the absorption of two concerns, one making cultivators and the other seeders. These will be built in addition to the Vim tractor.

NEW TRACTOR PLANT

FINLAY, July 11—The Star Tractor Co. proposes to double the size of its plant and to erect a second plant in a western state to handle business in that region. The company's capital stock has been increased from \$100,000 to \$300,000. The company manufactures the Indiana tractor.

French Want U.S. to Lower Car Duty

PARIS, July 5 (Staff Correspondence) —It is obvious that the French automobile industry is going to use every possible means to induce the American Government to abandon the present 45 per cent import duty on automobiles.

Prohibition has been in force in France during practically the entire war. Quite recently the French have returned to pre-war tariffs, plus a 10 per cent ad valorem tax for all trucks weighing not less than 5511 pounds. A 70 per cent ad valorem duty has been maintained, however, for all passenger cars.

There is no doubt that the French automobile manufacturers have induced the Government to adopt this measure with a view to bringing pressure on America. The 70 per cent duty is a temporary measure.

Negotiations are now in hand between the French and other European Governments for the adoption of reciprocal 15 per cent import duty on automobiles. An agreement has been arrived at between France and one European country and may go into effect within a few days. Negotiations are well advanced with two other European countries.

Nothing has yet been done between France and America. The outcome probably will be that France and other European countries will adopt reciprocal 15 per cent import duties, while the present French 70 per cent duty will remain in force against America.

Another indication of the French determination to force the American Government to consider this question is to be found in the rules of this year's Paris automobile Salon.

One of these rules states that foreign exhibitors who have exhibited for three previous years at the Paris show shall have the same rights as French firms, providing their import duty before Aug. 1, 1914, was not higher than 15 per cent ad valorem.

This hits directly at America. English, Belgian and Italian firms can come into the Paris show on the same conditions as the French. American firms have to be satisfied with the left-over space.

In official circles no secret is made of the fact that this has been done to force the American manufacturers and the American Government to action. It was practically impossible to obtain from the French Government a differential tariff against America, but by maintaining a temporary 70 per cent duty and granting exceptions on a 15 per cent basis to such nations as would give reciprocity, the French makers have obtained what they required without appearing to have framed a law to strike especially at America.

KEYSTONE SALES GROW

NEW YORK, July 16—Gross sales of \$5,570,120, as compared with \$3,000,672 in the same period last year, were reported by Keystone Tire & Rubber Co.

Belgian Car Makers Want Import Laws

Favor 15 Per Cent Reciprocal Arrangement with Allies— Would Cut Ameri- can Sales

BRUSSELS, July 4—Belgian automobile manufacturers have started a campaign for the adoption of reciprocal 15 per cent import duties between their country and France, England and Italy, to go into effect Jan. 1, 1920.

In adopting this attitude the Belgian makers have merely come into line with French manufacturers. The campaign is directed against America, which at the present time is supplying cars in important numbers to Belgium on the pre-war tariffs.

The Belgian automobile factories are not producing and cannot produce in any great quantities for at least a year. France, England and Italy are supplying a very small number of cars to Belgium. America is taking advantage of the present situation to sell both touring cars and trucks in Belgium on a big scale. The American firms which have obtained position on the Belgian market since this country was freed from German invasion are: Overland, Dodge, Briscoe, Ford, Reo and Studebaker.

Belgium is the only European country which has not adopted prohibition, and which has maintained its pre-war duties on automobiles. Italy has not changed its duties, but has adopted prohibition; France had prohibition during practically all the war, and has now a 70 per cent ad valorem duty on touring cars; England has a 33 1/3 per cent duty with restrictions on the number of cars to be imported. The Belgian makers have already appealed to Parliament on the subject of an increase in the import duties during the reconstruction period. As pressure was brought to bear at the same time by dealers who were anxious for a continuation of the present system, the Government refused to take action.

Notwithstanding this, the manufacturers have again resumed the attack and have sent in a petition to Parliament. In this document they point out that Belgium is the only country maintaining pre-war tariffs. They claim as the railways are now all running, the demand for automobiles in Belgium is not so pressing that importers cannot pay a substantial duty.

They state that representatives of three foreign firms claim already to have sold respectively 1600, 500 and 150 automobiles, this being in addition to the automobiles which have been recovered from Germany and to the Belgian army automobiles which will be offered for sale shortly.

Before the war there were 10,000 touring cars in Belgium. The annual production was 4500 cars, of which the great majority were exported. Up to the outbreak of the war the Belgian industry employed 8000 persons, in addition to 4000 in foundries and forges working almost exclusively for the automobile industry. The following is the list of factories and the number of men employed:

dries and forges working almost exclusively for the automobile industry. The following is the list of factories and the number of men employed:

Minerva	2,990
F. N.	2,000
Metallurgique	600
Pipe	380
Nagant	350
Germain	300
Sava	300
Springuel	300
Excelsior	200
Saroléa	200
Miesse	120
Frenay	100
Pescatore	100
Dasse	75
Total	8,015

Trucks Allotted for Public Roads

WASHINGTON, July 14—The fourth allotment of motor trucks, numbering 8771, has been turned over to the Bureau of Public Roads by the War Department, and in turn has been allocated to the various states, making a total of 20,522 trucks that have been distributed to the various states for road construction and maintenance.

The last allotment included nine types and many used trucks including miscellaneous light deliveries, all used, GMC 3/4-ton chassis used and new, miscellaneous 2-ton trucks used, Pierce-Arrow 2-ton trucks used and new, light aviation trucks used, miscellaneous 3-ton trucks used, Pierce-Arrow 3-ton trucks used and new, and heavy aviation types. Texas received 500, the largest number of trucks; New York was second with 427; Pennsylvania received 394, Illinois 375, and Ohio 318.

Attached is the complete list showing distribution:

Alabama, 180; Arizona, 117; Arkansas, 143; California, 261; Colorado, 149; Connecticut, 51; Delaware, 14; Florida, 201; Georgia, 201; Idaho, 104; Illinois, 375; Indiana, 231; Iowa, 250; Kansas, 249; Kentucky, 167; Louisiana, 117; Maine, 83; Maryland, 75; Massachusetts, 126; Michigan, 250; Minnesota, 244; Mississippi, 153; Missouri, 291; Montana, 173; Nebraska, 185; Nevada, 111; New Hampshire, 35; New Jersey, 102; New Mexico, 138; New York, 427; North Carolina, 195; North Dakota, 132; Ohio, 318; Oklahoma, 199; Oregon, 136; Pennsylvania, 394; Rhode Island, 21; South Carolina, 124; South Dakota, 138; Tennessee, 193; Texas, 500; Utah, 99; Vermont, 40; Virginia, 170; Washington, 124; West Virginia, 90; Wisconsin, 217; Wyoming, 104; Dept. Agriculture, 446. Total, 8771.

SURPLUS SALES \$8,027,189

WASHINGTON, July 14—Surplus sales of the War Department total \$8,027,189.17 for the week ended July 4. Aircraft sales amounted to \$388,841.13, of which \$216,023.80 was derived from the sale of surplus lumber. The Ordnance Department sold metal stocks totaling \$782,824.67.

The total sales up to July 4 were \$344,000,000, as against an estimated surplus of \$1,932,000,000. The total amount sold to June 4 had an estimated value of \$429,000,000, making the total sales to-day 22 per cent of all surplus.

Michigan and Ohio Strikes Are Subsiding

DETROIT, July 15—Although many strikes are still in progress, manufacturing operations in the plants affected are rapidly becoming normal again. The last ten days has seen big increases in production at the Timken-Detroit Axle Co. plant, the Wadsworth Mfg. Co. and in the half-dozen foundries where walk-outs have occurred. The Timken-Detroit company is now operating with a two-thirds force, while the Wadsworth company has the required number of employees back.

The radical movement in Detroit is rapidly subsiding. There is less unrest among the workmen in the manufacturing plants now than at any previous time in the last six months. Increased wage scales and rapidly improving housing conditions have made the workers more content. The housing situation is showing marked improvement and within ninety days Detroit expects to be able to house a majority of its new citizens.

During the month of June, construction figures broke all records. Building permits totaling 2400 called for an expenditure of \$6,648,445. Most of the new building work is on homes and apartment houses.

TOLEDO, July 15—Production at the Willys-Overland plant is now averaging 250 completed machines a day. During the week just ending 1200 additional men returned to work, bringing the total number now employed in the shop up to 8500. There were 13,500 men on the payroll the day the strike was called three months ago.

BLOCK ISLAND BOAT RACE

NEW YORK, July 12—Eleven cruising motor boats started to-day in the tenth annual race to Block Island held by the New York Athletic Club. The boats were divided into two classes according to length: Class A for boats over 40 ft. and Class B for those below this size.

Of the four boats in Class A, *Gardenia*, owned by Harry Anderson of the N. Y. A. C., made the best time, 11:09:05, and won the trophy offered by Commodore C. H. Sunderland.

In Class B, *Old Glory IV.*, owned by George P. Bonnell, made the best elapsed time (11:56:10) but was beaten on corrected time (11:12:35) by *Victory II.*, in 10:25:23, owned by Harry Jackson of the N. Y. A. C. and *Kodak* in 10:40:43, owned by H. J. Haslinger of the Hudson River Y. C. The course is 100 nautical miles.

TIRE MAKER STILL LIVES

PARIS, June 28—The reported death of Senator Pirelli, head of the Pirelli Tire Co., Milan, Italy, on the sinking of the steamer *Citta di Milano*, is now declared to be correct. A person of the same name was drowned when this steamer was sunk and, as Senator Pirelli was away from home at that time, it was thought that he was the victim.

UTILITOR FOR FARM

INDIANAPOLIS, IND., July 11—An agricultural machine which combines the functions of a small tractor and a mobile power plant, known as the Utilitor, is made by the Midwest Engine Co.

The Utilitor is designed to do 1-horse work on a farm. It will haul, plow, cultivate, handle a harrow or a mower, or any other 1-horse tillage machine. It can also be used on a belt for all light farm power-driven machinery.

CRAIG IN OHIO DEMONSTRATIONS

CLEVELAND, July 11—The Craig tractor, manufactured by the Craig Tractor Co., will be introduced to the farmers of Ohio by participation in the four Ohio State tractor demonstrations which will be held between July 28 and Aug. 15 under the direction of Professor Ramsower of the Ohio State University. A few minor changes have been made. A model was shown at the Kansas City Tractor Show last winter.

BEAN TRACTORS COMING EAST

SAN JOSE, CAL., July 11—The Bean Spray Pump Co., manufacturing two Track Pull tractors, one for field and one for orchard work, will introduce its product in the middle west this season. Announcement of this expansion policy will be made at the Wichita demonstration this week. Heretofore distribution has been confined to the Pacific coast.

GILE COMPANY CHANGES NAME

LUDINGTON, MICH., July 11—The Stearns Motor Manufacturing Co. has succeeded the Gile Tractor & Engine Co. The company is bringing out a tractor of 3- and 4-plow capacity of the frameless type, with a rating of 36 hp. on the belt. Another new product will be a heavy duty engine, known as model "AU," designed especially for tractors.

YUBA TRACTOR DISTRIBUTION

MARYSVILLE, CAL., July 11—The Yuba Manufacturing Co., maker of the Yuba Ball Tread tractor, will have distribution in the middle west.

DIVIDENDS DECLARED

The Keystone Tire & Rubber Co., New York, has declared a 15 per cent dividend, payable Sept. 15. Shareholders of record of July 21 will be permitted to subscribe one share of new stock for every three shares now held at \$40 each.

The Hayes Mfg. Co., Jackson, Mich., 2 per cent dividend on preferred stock and 1½ per cent on common stock, the latter to be paid in Liberty bonds in multiples of \$50 and the balance in cash. Both payable Aug. 1 to stockholders of record July 15.

The Prudden Wheel Co., Lansing, Mich., cash dividend of 5 per cent paid July 15. This is the first dividend since 1917.

**Current News of
Factories****Notes of New Plants—
Old Ones Enlarged****PLOWMAN TRACTOR REVIVED**

WATERLOO, IOWA, July 11—The Interstate Tractor Co. has been purchased by L. C. Stearns, Minot, N. D., and the business will be revived under the name of the Plowman Tractor Co. It is understood the old Plowman tractor, made by the original company, will be redesigned and brought up to date, without, however, fundamentally changing the characteristic features.

L. C. Stearns, manager of the Minot Auto Co., Minot, N. D., Overland distributor for North Dakota and Montana, helped to introduce the original Plowman tractor in the northwest. When the company fell into financial difficulties he undertook a reorganization. Production will be resumed at an early date.

NEW WHEEL FACTORY

HAGERSTOWN, MD., July 12—The National Wire Wheel Works, Inc., has moved from its factory at Geneva, N. Y., to its new plant here. New quarters afford facilities for the manufacture of 1,000,000 wheels a year.

General sales offices of the company have been transferred from Geneva, N. Y., to the Book Building, Detroit, and will be in charge of J. L. Justice, general sales manager. Export business is handled by Reed-Williams of New York City.

ECONOMY CARBURETER

MILWAUKEE, July 15—The Economy Carbureter Co. has been organized with a capital stock of \$50,000 to manufacture a carbureter designed by Eugene Drachonovsky and in practical test for nearly two years. Joseph Stoll and Ray Huelsbeck are associated with the inventor. A plant is being equipped. A special carbureter for Ford will form the principal part of the output.

FULTON MOVES OFFICES

NEW YORK, July 12—The general offices and sales department of the Fulton Motor Truck Co. have been moved from the factory at Farmingdale, L. I., to 1710 Broadway. F. W. Melhuish, president of the company, has resigned to become chairman of the board of directors.

BUILDING FOR MACHINE CO.

PONTIAC, MICH., July 11—A building 60 x 200 ft. is being erected for the Van Auken Machine Co., to be completed within 30 days.

GRIP NUT WILL BUILD

CHICAGO, July 11—The Grip Nut Co. has purchased 250,000 sq. ft. of land between Western Avenue and the Baltimore & Ohio terminal, upon which it will build a plant with equipment costing \$500,000. The company now has plants in South Whitley, Ind., and Columbus, Ohio. Construction will begin immediately.

DETROIT SHELL CO. FOR SALE

DETROIT, July 14—The plant of the Detroit Shell Co., formerly the plant of the Springfield Body Corp., is for sale. Sealed bids are being received by John Kelsey, president of the company. The property consists of 27.13 acres together with buildings having 160,000 sq. ft. of floor space.

RELIANCE DOUBLES CAPITAL

APPLETON, WIS., July 14—The Reliance Motor Truck Co., Appleton, Wis., which was thoroughly reorganized early this year, will increase its capital stock from \$500,000 to \$1,000,000. The company manufactures the Badger external spur gear drive rear axle.

GOODRICH OFFERS STOCK

CHICAGO, July 12—The B. F. Goodrich Co. is offering 1773 shares of new preferred at \$102 to preferred and common stockholders of record July 1. Accrued dividends from July 1 to Aug. 1 included make the price \$102.58.

TIMKEN AXLE BUILDING

DETROIT, July 11—The Timken-Detroit Axle Co. will erect a building 30 x 300 ft. and another 60 x 120 for heat treating, to be completed in 45 working days at a cost of \$50,000.

FOREIGN REPRESENTATIVE

TOLEDO, July 12—The Milburn Wagon Works, manufacturer of the Milburn electric, has appointed the Automotive Products Corp., New York City, as its foreign trade representative.

GENERAL HARVESTER CO.

PORT HURON, MICH., July 13—Claims of creditors of the defunct American Machines Corp. will be adjusted within 30 days, and a new company to take over the old one will be opened and doing business within 60 days, according to men who were in charge of the old company here. Bankruptcy proceedings are pending in the United States District Court.

A. Grant Armstrong, formerly head of the American Machines Corp., has enlisted new capital in the reorganization. The new company, which will be known as the General Harvester Co., has filed articles of incorporation with the secretary of state and has obtained options on five large plants throughout the country, two of which are to be moved to this city.

British Restrictions on Imports to Stand

LONDON, June 28—The American Chamber of Commerce says that the Import Consultative Council, which the Board of Trade set up to examine and revise the British import restrictions, has wound up its work and disbanded. This means, according to the American Chamber, that there will be practically

no change whatsoever in the British restrictions as they now exist until the end of the transitional period on Sept. 1.

The question was put in Parliament on June 25 as to whether after Sept. 1 the British market would be open to unrestricted competition and the reply was made that the government had undertaken to reconsider the position of import restrictions by Sept. 1, but that no authority had been given that the restrictions would not be continued.

United States Exports of Cars, Trucks and Parts, By Countries, During May, 1919

Countries	Commercial		Passenger		Parts Value
	Number	Value	Number	Value	
Belgium	32	\$54,549	56	\$63,249	\$1,477
Denmark	177	746,500	109	138,191	3,889
France	..	..	76	294,238	22,314
Gibraltar	..	..	..	..	33
Greece	3	1,753	53	51,278	6,697
Iceland and Faroe Islands	7	9,061	25	19,275	3,030
Italy	..	..	..	..	13,440
Netherlands	..	..	25	27,002	6,813
Norway	109	240,772	102	159,994	6,198
Portugal	..	..	..	..	11
Spain	2	1,619	85	83,515	9,665
Sweden	16	56,174	29	35,015	..
Switzerland	1	503	22	38,680	8,681
Turkey in Europe	..	..	11	7,950	61,837
England	8	13,615	110	153,622	476,593
Ireland	..	..	30	46,545	1,145
British Honduras	..	..	7	2,999	267
Canada	200	335,819	1,012	1,035,167	1,506,860
Costa Rica	..	..	1	1,040	2,066
Guatemala	..	..	17	19,953	2,756
Honduras	..	..	2	1,154	1,262
Nicaragua	..	..	13	7,945	1,140
Panama	1	700	4	3,744	9,918
Salvador	..	..	15	15,403	2,008
Mexico	83	110,739	312	235,153	45,151
Newfound'd and Labrador	2	3,880	1	600	1,194
Barbados	6	3,023	15	11,579	1,550
Jamaica	10	8,163	7	5,212	15,229
Trinidad and Tobago	1	2,213	7	7,168	7,439
Other British West Indies	1	450	5	2,441	2,553
Cuba	67	133,281	337	312,768	205,865
Danish West Indies	..	..	1	1,000	246
Dutch West Indies	..	..	..	..	278
French West Indies	7	8,316	8	4,182	7,338
Haiti	2	1,007	21	9,615	12,594
Dominican Republic	..	..	5	5,748	8,562
Argentina	4	10,096	203	223,887	276,365
Bolivia	..	..	..	..	1,465
Brazil	15	15,422	246	212,135	89,198
Chile	..	..	22	16,418	35,221
Colombia	3	1,515	9	10,992	6,396
Ecuador	..	..	14	24,563	2,889
British Guiana	..	..	5	4,568	2,540
Dutch Guiana	..	..	..	..	223
Peru	2	6,532	18	35,701	22,499
Uruguay	..	..	284	198,583	40,878
Venezuela	5	2,515	20	26,031	10,039
China	27	71,654	187	188,218	29,122
Japanese China	..	..	..	..	28,610
Chosen	..	..	..	..	2,175
British India	22	50,630	98	108,738	40,026
Straits Settlements	12	26,798	81	89,869	18,807
Other British East Indies	6	12,475	..	..	1,195
Dutch East Indies	17	33,570	148	163,194	57,779
French East Indies	..	..	1	2,800	1,412
Hongkong	..	..	29	38,747	2,600
Japan	182	264,392	259	192,002	53,591
Russia in Asia	..	..	35	26,045	115,689
Siam	..	..	..	..	2,408
Australia	45	65,674	149	154,936	128,927
New Zealand	2	1,500	192	221,114	29,495
Other British Oceania	..	..	..	..	81
French Oceania	..	..	2	3,490	290
German Oceania	..	..	..	..	1,253
Philippine Islands	61	106,985	340	322,201	98,821
Belgian Kongo	..	..	..	..	800
British West Africa	8	10,231	2	1,500	9,900
British South Africa	7	11,805	239	394,511	205,537
British East Africa	..	..	..	..	3,986
French Africa	3	8,406	16	9,074	24,248
Morocco	2	1,008	96	46,379	7,259
Portuguese Africa	..	..	..	..	60
Egypt	..	..	..	..	1,528
Totals	1,158	\$2,433,375	5,218	\$5,517,121	\$3,812,391
Shipments to:					
Alaska	2	\$2,745	5	\$5,438	\$2,314
Hawaii	3	9,107	12	19,360	25,500
Porto Rico	2	6,696	18	29,989	28,269

This table supplements the one which appeared in the July 3 issue of AUTOMOTIVE INDUSTRIES, and gives figures of all the individual countries, including those generally grouped under the collective heading of "Other Countries."

GEOGRAPHIC CODE SYSTEM

WASHINGTON, July 14—The War Department has adopted a geographic code system, designed by G. W. R. Harriman of this city, following extensive investigation of the invention.

The system subdivides the surface of the world into a number of unit areas bounded by latitude and longitude lines and not by political boundaries. The units as divided by the system are in turn assembled and grouped into larger unit areas or subdivided into smaller unit areas as the case may require, and are all identified by a geographic code index number.

The surface of the earth is subdivided into a series of units so numbered that any point may be designated or any two points, with the intervening territory and all the mileage data, shown.

Further, by means of the Harriman Geographic Code System, all geographic, commercial, manufacturing, industrial, military or statistical data is readily compiled and correlated for any given geographic location and by the use of a series of base paper negatives the geographic data of any location may be readily assembled into a single geograph and reproduced in finished black and white map form in a few minutes as a complete record.

FOREIGN TRADE OPPORTUNITIES

WASHINGTON, July 14—The Bureau of Foreign & Domestic Commerce, Department of Commerce has received requests for automobiles or parts agencies from individuals and companies in foreign countries. For further information address the Bureau of Foreign & Domestic Commerce and specify the Foreign Trade Opportunity Number.

Belgium—Carriage and cart axles, machines to manufacture carriage and cart axles and light automobiles. Quotations should be given c.i.f. Antwerp. Payment, cash against documents. Correspondence may be in English. No. 29941.

West Indies—Motor trucks suitable for carrying 500 to 1000 lb. of mail and five or six passengers over hilly roads, with gradients up to 8 per cent, at an average speed of 12 m.p.h. No. 29943.

Persia—Bicycles. Quotation should be given c.i.f. Persian port. Payment upon arrival of goods. Correspondence should be in French. No. 29948.

Algeria—Automobiles and trucks for Tunis, Algeria and Morocco. Correspondence should be in French. No. 29894.

Portugal—Bicycles, motorcycles and automobiles. Correspondence should be in Portuguese. Catalogs and price lists should be submitted. No. 29910.

Switzerland—Machine tools, standard and special machinery, machinery accessories and parts, such as roller bearings, gears and pulleys; radiators and also iron, steel, metals and automobiles. No. 29,697.

Fords Buy Up Minority Stock

(Continued from page 134)

at the present Ford plant and placed on sale as a new Ford model.

"Of course there will be no need of a new company now," said Edsel Ford. "We will develop our plans for the new car in the Highland Park plant which we now control. We will try to be ready to manufacture it just as soon as we catch up with orders on the present standard models. We are overflowing with orders for standard cars, however. We are making about 3,200 daily and orders are coming in for more than 4,000 daily. Plans for the next fiscal year, beginning August 1, call for greatly increased production. It is probable that some of our other plants which are now used for assembling, will be equipped to do some of the manufacturing.

"The completion of these negotiations leaves us free to do as we like in the expansion of business."

Ford's Romantic History

The history of the Ford Motor Co. is one of the greatest romances of modern business. The company has grown in sixteen years from a little machine shop with a working capital of \$28,000 into an organization with assets of more than \$250,000,000. The men who backed Henry Ford in his early ventures in the internal combustion vehicle field, were, with two exceptions, poor men who risked everything they had on their belief in the man and his plan.

To Alex Y. Malcomson, coal miner and shipper, must go a large measure of the credit for the organization of the Ford Motor Co. He assumed the role of financial angel for the struggling concern. He was a fairly wealthy man and it was his money that put the company in a way to turn out its first models. It was through Malcomson, a legal client of Horace Rackham, that Rackham, Anderson and several others of the original company were induced to invest their money. Anderson and Rackham were law partners.

James Couzens, then cashier in the Malcomson coal office, caught the spirit of the venture to a much greater degree than did the other investors. He became so enthusiastic over the gas engine Ford had developed that he resigned his job in the coal office to put the Ford Motor Co. office in order and establish a sales organization.

First Ford Sold in 1903

The first Ford car was sold in July, 1903. It was a two-cylinder, opposed type engine light runabout. Production on a quantity basis was then entered into, 650 cars being assembled and sold that summer, an unheard of record in production in the motor car industry as it then existed.

The Ford Co., according to its last annual statement, had total assets of \$203,749,460, including \$37,117,363 in real estate; \$29,335,982 machinery and equipment, \$44,522,562 material in process of

manufacture; \$91,471,851 cash and accounts receivable; \$67,981 patent rights; \$1,231,906 inventories and \$1,815 investments. Against this was checked liabilities of \$2,000,000 capital stock; \$10,653,327 accounts payable; \$5,950,564 accrued expenses; \$9,902,841 depreciation reserve and \$175,242,728 surplus.

The company has twenty-eight branch factories in the United States and three factories and seven branch houses in Canada. Approximately 3,200,000 Ford cars have been produced since organization of the company. Production is now 3,200 cars daily.

Auto-Lite Obtains New Factory; Makes Farm Light

NEW YORK, July 16—Coincident with the announcement that the Electric Auto-Lite Co., Toledo, had leased the old Fiat factory at Poughkeepsie comes word from the corporation's headquarters that it is about to enter the farm lighting field.

In the farm lighting machine the Willys-Knight engine will be used, being produced at the Elyria, Ohio, factory and sent to Toledo for assembling with parts made in the company's various plants. It is planned to conduct production on a scale to insure placing of the machine on the market in adequate quantity Aug. 15.

The Poughkeepsie plant will be used to manufacture Auto-Lite products particularly for the eastern and export trades. The company has a six months' lease, with a purchase option, on the property, which was used during the war by the Duesenberg Motor Co.

CASE BUYS PROPERTY

ST. LOUIS, July 12—The J. I. Case Threshing Machine Co. of Racine, Wis., has purchased the property of the defunct Mutual Brewery Co., at the southeast corner of Forest Park Boulevard and Boyle Avenue, 400 by 192 ft. 8 in.

FORDSON OUTPUT GROWS

DEARBORN, MICH., July 15—More than 1200 tractors were made and shipped from the Fordson plant at Dearborn last week. The daily average was 200 complete machines, which production will be increased to 400 as rapidly as possible.

NEW MEN ON HIGHWAYS BOARD

WASHINGTON, July 15—John W. Halowell was named to-day by Secretary Lane to represent the Department of Interior in the Highways Committee and Lt. Col. J. M. Ritchie of the Motor Transport Corps was appointed by Secretary Baker to represent the War Department.

SALES MANAGERS' MEETING

DETROIT, July 13—The National Association of Motor Truck Sales Managers' has postponed its national convention scheduled for this city July 25-26. The new dates, either September or October, are to be decided upon within a week.

Buick and Columbia Announce New Prices

FLINT, MICH., July 16—Prices of the new Buick cars are the same as last year for all open touring machines, but the Buick Motor Co. has increased its enclosed body prices as follows:

	New Price	Old Price
3-passenger roadster.....	\$1,495	\$1,495
5-passenger touring car....	1,495	1,495
7-passenger touring car....	1,785	1,785
Touring coupé	2,085	1,985
5-passenger touring sedan..	2,255	2,195
7-passenger sedan.....	2,695	2,585

All prices are F.O.B. Detroit.

DETROIT, July 15—The Columbia Motors Co. has increased the price of all models. The new prices are effective at midnight, to-night, and consist of a \$100 increase on open cars and \$400 on enclosed models, as follows:

	New Price	Old Price
Standard touring car.....	\$1,695	\$1,600
Sport model.....	1,845	1,745
Roadster	1,845	1,745
Sedan	2,850	2,445
Coupé	2,850	2,445

TRAFFIC CENSUS TAKEN

WASHINGTON, July 12—The improved roads of Milwaukee County, Wis., save \$25,000 a day to the people who use them, is the report received by the Bureau of Public Roads of the United States Department of Agriculture from the county commissioner of highways. The statistics are based on a census of the traffic taken periodically during the past four years.

This census was taken to determine the durability of certain types of pavement, according to the amount of traffic per sq. yd. It shows that about 25,000 vehicles of all kinds travel the highways each day. Traffic on the road has increased about 42 per cent a year during the 4 years in which the survey has been made.

ROAD WORK RECORD

WASHINGTON, July 12—One hundred and thirty-three state requests for Federal aid for highway improvements were approved by the Department of Agriculture during June. This involved 1,390.29 miles of road at a total estimated cost of \$24,220,808.90, on which Federal aid amounting to \$11,034,289.12 was requested. This represents the largest cost estimated and the largest amount of Federal aid requested during any month.

During the month 60 projects were executed by the Department of Agriculture and the State Highway Departments, involving 507 miles of roads costing \$7,566,089.32, of which \$3,404,269.18 was Federal aid.

Up to and including June 30, 1919, project statements for a total of 1319 projects had been approved. The 1319 projects involve 12,790.37 miles of road, a total estimated cost of \$133,833,300.67, and a total of 677 project agreements had been executed, involving 5,776.39 miles of road, a total estimated cost of \$56,367,334.94, and a total of \$23,892,740.97 Federal aid.

SERVICE PERSONNEL CHANGES

WABASH, IND., July 11—R. C. Spinning, formerly assistant manager of sales and advertising for the Service Motor Truck Co., has been made advertising manager. Frank L. Johnson will be manager of sales promotion. Mr. Johnson was formerly with Stutz and Simplex organizations, and was with the White Co. until his enlistment in the Marine Corps, where he served as lieutenant. E. T. Herbig, who has been both sales and advertising manager, will assume the duties of sales director.

F. I. Reynolds, for many years with the United States Tire Co., New York, as sales manager of pneumatic tires, has been appointed sales director of the Keystone Tire & Rubber Co., New York. He was previously connected with the Diamond Rubber Co. as sales manager, and after its absorption, was with the B. F. Goodrich Co., Akron.

John B. Castino will be district manager in charge of the Chicago office of the SKF Industries, Inc., recently opened at 1314 Marquette Building.

Charles C. Walsh has been appointed sales representative for Michigan and Indiana for the F. R. Blair & Co., Inc., New York City.

I. B. Meers has resigned as general sales manager of the Panhard Motors Co., Grand Haven, Mich. He has not yet announced any definite future plans.

Mrs. E. J. Schoonmaker has been promoted from the cost accounting department of the Bantam Ball Bearing Co., Bantam, Conn., to the position of treasurer, recently made vacant by the resignation of Miss Ruth Edwards.

E. S. Cole, for many years identified with the White Co. and later in St. Louis as manager for Missouri, Arkansas and Oklahoma for the Little Giant truck, has been appointed Canadian sales representative of the Traffic Motor Truck Corp.

Inglish Horckitz, formerly with the Fred Campbell Auto Supply Co., has been appointed district manager of the Ever Tight Piston Ring Co., with headquarters in St. Louis. His territory includes the eastern half of the United States.

Guy W. Yaugham, formerly in charge of production for the Wright-Martin Aircraft Corp., New Brunswick, N. J., has been appointed vice-president and general manager of the Van Blerck Motor Co., Monroe, Mich.

Charles Melhado, who has been with the Republic Motor Truck Co. for four years, has been appointed sales manager for South America and the West Indies. He has left on a trip through South and Central America.

Rube E. Allmart, eastern district sales manager of the Westcott Motor Car Co., Springfield, Ohio, was killed in the New York Central wreck at Dunkirk, N. Y., July 1, in his 35th year.

Men of the Industry

Changes in Personnel and Position

RICE G. M. C. VICE-PRESIDENT

NEW YORK, July 12—H. H. Rice, former treasurer, was elected vice-president of the General Motors Corp. at a directors' meeting yesterday. M. L. Prensky was promoted from comptroller to treasurer and Frank Turner was made comptroller.

G. M. C. TRUCK STAFF

PONTIAC, July 11—Changes in the staff of the General Motors Truck Co. have been made. H. L. Hurst, who has been comptroller, has become assistant to general manager W. L. Day. W. H. Maybury, who was assistant comptroller, has become comptroller. J. A. Murray, who was purchasing agent, has been advanced to assistant to Mr. Hurst and H. J. Crichton, who was assistant purchasing agent, is now purchasing agent.

Clarence A. Triphagen, manager of the Reo factory branch at Lansing, Mich., has been made manager of the factory branch at Detroit. W. Carl Parker, head of the truck sales promotion department, succeeds Mr. Triphagen as manager of the Lansing branch, effective Aug. 1. The Detroit salesrooms will be at 975-977 Woodward Avenue, and the service station at 38 West Warren Avenue. The branch will employ 50 men.

E. B. McCoy, for two years advertising manager of the Olds Motor Works, has been made head of the sales promotion department, a new division of the sales organization. The advertising department is now in charge of L. S. Roscoe, who was formerly assistant to Mr. McCoy. L. E. Curphey has succeeded Fabio Sergardi as chief engineer of the company.

A. E. Aurand, formerly designing engineer for the Zenith Carburetor Corp., has been appointed chief engineer of the Claudel Carburetor Co.

C. B. Curtiss, formerly sales manager for the Wicks Boiler Co., Saginaw, Mich., recently purchased an interest in the Bay City Foundry & Machine Co., and became sales manager. He succeeds J. E. Johnson, resigned. His office will be at the factory in Bay City.

Albert A. Fair has resigned as assistant treasurer for the Ohio Savings Bank & Trust Co., Toledo, to become secretary of the City Machine & Tool Co. of that city.

William J. Lane, for six years purchasing agent of the Maxwell Motor Co., Detroit, has resigned and is now associated with the selling force of the Trumbull Steel Co., with offices in Detroit.

ROLLS-ROYCE HEAD HERE

NEW YORK, July 12—Claude Johnson, managing director of Rolls-Royce, Ltd., arrived here yesterday from London for a conference with American representatives of the famous British motor corporation. He was not at liberty, he said, to discuss the company's American affairs.

MAJOR WITH REPUBLIC

ALMA, MICH., July 12—Major William M. Britton, one of the designers of the standard military truck and recently discharged from the army, has become chief engineer of the Republic Motor Truck Co.

RELIANCE INCREASES CAPITAL

APPLETON, WIS., July 14—Stockholders of the Reliance Motor Truck Co. at a special meeting approved an increase in the capital stock from \$500,000 to \$1,000,000 and authorized the construction of a large factory addition which will cost \$125,000. The new facilities will be used both for truck manufacture and the production of the Badger external spur gear drive axle, which the company is building.

LARGEST GOODRICH BUILDING

AKRON, OHIO, July 11—A new building which will be the largest of the 84 in use by the B. F. Goodrich Co., will soon be under construction. It will be 170 x 300 ft., eight stories high. The warehouse will be built next to railroad siding and will have an unloading platform and seven special elevators.

F. W. D. MILWAUKEE BRANCH

CLINTONVILLE, WIS., July 14—The F. W. D. Auto Co. has opened a branch office, salesroom and service station at 452 Jackson Street, Milwaukee, under the management of G. B. Megran.

MICHIGAN AUTOMOBILE SHOW

DETROIT, July 14—The Michigan State Fair is planning to hold a motor show in connection with the annual agricultural exposition Aug. 19 to Sept. 2. The show will include trucks and accessories in addition to passenger cars.

U. Ellis Lazelle has been made superintendent of the Ford Motor Co. of Canada. Previous to assuming his new position Mr. Lazelle was connected with the Ford service department of the Canadian plant for several years.

Harris N. Pickett, until recently advertising and assistant sales manager of the General Asbestos & Rubber Co., Charleston, S. C., has been appointed advertising manager of the Ohio Trailer Co., Cleveland.

James A. Stairs has concluded his work as general superintendent of the ordnance department of the Harroun Motors Corp., Wayne, Mich. He is taking a vacation before undertaking new employment.

Calendar

SHOWS

- Aug. 30-Sept. 6—Minnesota State Fair.
- Sept. 1-6—Indianapolis, Ind. State Fair. Cars and Accessories, Indianapolis Automobile Trade Assn., John B. Orman, Manager.
- Sept. 13-20—Cincinnati, O. Ninth Annual Music Hall, Cincinnati Automobile Dealers' Assn., H. K. Shockley, Manager.
- Sept. 15-20—Springfield, Mass. Eastern States Exposition.
- *Oct. 9-19—Paris. Grand Palais, International Automobile Mfrs. Congress.
- Nov. 3-8—Chicago, Ill. Business Exhibit of Automotive equipment Assn., Medinah Temple.
- Nov. 7-16—London. Olympia Motor Car Exhibition—Society of Motor Mfrs. and Trades.
- December—Brussels. International Automobile Mfrs. Congress.
- January—New York. International Automobile Mfrs. Congress.
- Jan. 3-10—New York, N. Y. Grand Central Palace, National Automobile Chamber of Commerce, S. A. Miles, Manager.
- Jan. 24-31—Chicago, Ill. Coliseum, Cars; Drexel Pavilion, Trucks; National Automobile Chamber of Commerce, S. A. Miles, Manager.
- February—Chicago. International Automobile Mfrs. Congress.
- Feb. 23-March 6—Birmingham, Eng. British Industries Fair.

AUTOMOTIVE SHOWS AT FAIRS

- Aug. 9-14—Sedalia, Mo. Tractors, Missouri State Fair. Kansas City Tractor Club.
- Aug. 20-29—Des Moines, Ia. Machinery Hall.
- Aug. 26-29—Madison, Wis. Cars, trucks and tractors, accessories, Dane County Fair, Madison Assn. of Commerce.
- Aug. 26-29—Columbus, O. Cars and tractors. E. V. Walborn, Manager.
- Aug. 31-Sept. 5—Lincoln, Neb. Cars, trucks and tractors. E. R. Danielson, Supt. of Concessions.
- Sept. 1-5—Hartford, Conn. Connecticut Fair Assn.
- Sept. 1-5—Wheeling, W. Va. Cars, trucks and tractors.
- Sept. 1-6—Rochester, N. Y. Automobile Club of Rochester. E. F. Edwards, Manager.
- Sept. 1-6—Spokane, Wash. Cars, trucks and tractors.
- Sept. 8-13—Helena, Mont. Cars, trucks and tractors.
- Sept. 8-13—Milwaukee, Wis. Milwaukee Automobile Dealers, Inc., Bart J. Ruddle, Manager.
- Sept. 8-13—Syracuse, N. Y. Cars, trucks and tractors.
- Sept. 8-13—Topeka, Kan. Cars, trucks and tractors, Motor Hall and Machinery Field.
- Sept. 9-13—Douglas, Wyo. Cars, trucks and tractors.
- Sept. 12-20—Peoria, Ill. Cars, trucks and tractors.
- Sept. 13-20—Hutchinson, Kan. Cars, trucks and tractors.
- Sept. 14-20—Sioux City, Ia. Cars, trucks and tractors.
- Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.
- Sept. 15-20—Springfield, Mass. Cars, trucks and tractors. O. A. Nash, Asst. Gen. Manager.
- Sept. 15-20—Yakima, Wash. Cars, trucks and tractors.

- Sept. 16-19—Billings, Mont. Cars, trucks and tractors.
- Sept. 20-27—Oklahoma City, Okla. Cars, trucks and tractors. J. S. Malone, General Manager.
- Sept. 20-27—Memphis, Tenn. Cars, trucks and tractors.
- Sept. 22-27—Pueblo, Col. Cars, trucks and tractors. J. L. Beaman, Manager.
- Sept. 22-27—Salem, Ore. Cars, trucks and tractors.
- Sept. 24-Oct. 4—Kansas City, Kan. Cars, trucks and tractors.
- Sept. 29-Oct. 4—Meridian, Miss. Cars and tractors. A. H. George, General Manager.
- Sept. 29-Oct. 4—Chattanooga, Tenn. Chattanooga Auto Dealers' Assn.
- Sept. 29-Oct. 4—Muskogee, Okla. Cars, trucks and tractors.
- Sept. 30-Oct. 3—Brockton, Mass. Cars.
- Sept. 30-Oct. 4—Lancaster, Pa. Lancaster Fair Assn.
- October—Columbia, S. C. Columbia Automobile Dealers' Assn.
- Oct. 20-25—Raleigh, N. C. Cars, trucks and tractors.
- Oct. 22-27—Shreveport, La. Cars, trucks and tractors.

- Sept. 9-12—Streator, Ill. Northern Illinois Tractor & Truck Assn.
- Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.
- Oct. 14-16—Ottawa, Ont., Can. Interprovincial Plowing Match and Tractor Demonstration.

CONTESTS

- July 19—Uniontown, Pa. Speedway race.
- *Aug. 15—Middletown, N. Y. Dirt track event.
- *Aug. 22-23—Elgin, Ill. 308 Mile road race.
- *Sept. 1—Uniontown, Pa. Speedway race.
- *Sept. 20—Sheepshead Bay, L. I. Speedway race.
- *Sept. 27—Allentown, Pa. Dirt track event.
- *Oct. 1—Cincinnati, O. Speedway race.
- *Oct. 4—Trenton, N. J. Dirt track event.
- *Oct. 11—Danbury, Conn. Dirt track event.

*Tentative dates.

TRACTOR SHOWS

- July 14-19—Wichita, Kan. Automotive Committee of National Implement Assn.
- July 23-29—Columbus, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.
- Aug. 1-2—Piqua, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.
- Aug. 19-21—Aberdeen, S. D. Tractors, Tractor Accessories and Farm Lighting Plants. Aberdeen Commercial Club.

CONVENTIONS

- Sept. 22-24—Philadelphia. Annual Convention, National Association of Purchasing Agents. Bellevue-Stratford.
- Oct. 1—Denver, Col. Directors' Meeting, National Automobile Dealers' Assn.
- Nov. 3-8—Chicago, Ill. Convention, Automotive Equipment Assn., Medinah Temple.
- January, 1920—Washington. Pan-American conference.
- May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

FOREIGN CONSULS HERE

WASHINGTON, July 11—The following American Consular Officers are in the United States temporarily and will be glad to confer with business men and commercial organizations relative to conditions in their respective countries:

Henry D. Baker, of Trinidad, who will leave July 28, can be reached in care of Harris Trust & Savings Bank, Chicago. Thomas H. Bevan, of Glasgow, Scotland, leaving Aug. 9, can be reached at Arlington, Baltimore, Md. Lloyd Burlingham, of Santa Cruz, Mexico, leaving July 28, is at 112 S. Seventh Street, Olean, N. Y.

S. J. Lespinasse, of Cartagena, Colombia, leaving July 27, is at 23 Rector Place, Red Bank, N. J. Will L. Lowrie, of Lisbon, Portugal, can be reached at Elgin, Ill. C. K. Moser, of Harbin, China, should be addressed in care of Harless H. Moser Cupertino, Santa Clara county, Cal.

John Ball Osborn, of Havre, France, leaving July 5, can be reached in care of Mrs. F. D. Grinnell, East Haven, Conn. Alexander M. Thackara, of Paris, France, will leave here Aug. 23. He can be reached in care of Consular Bureau, Dept. of State. Henry T. Wilcox, of Guadeloupe, is leaving Aug. 11. He is now at 19 N. Boulevard Vineland, N. J. Alfred A.

Winslow, of Auckland, New Zealand, can be addressed in care of District Office, Bureau of Foreign and Domestic Commerce, 504 Federal Bldg., Chicago, Ill.

CATALOGS FOR EAST INDIES

WASHINGTON, July 11—Catalogs and advertising literature of cars and tires from manufacturers in the United States are desired by Trade Commissioner John A. Fowler, for the purpose of acquainting firms of the Dutch East Indies and Straits Settlements with automotive products manufactured in this country. Communications should be addressed to the Bureau of Foreign & Domestic Commerce, Division of Foreign Investigations, Washington, D. C., for Trade Commissioner Fowler.

WAGES INCREASE 22 PER CENT

WASHINGTON, July 11—Wages paid in the automobile industry increased from \$2,497,874 in April, 1918, to \$3,050,270 in April, 1919, an increase of 22.1 per cent, and at the same time the numbers on the payroll totaled 103,853, increasing in April, 1919, to 107,088 or 3.1 per cent. These figures are based on reports of 46 manufacturers in the automobile industry who filed statements with the Department of Labor.

TESTING LABORATORY

ANN ARBOR, MICH., July 3—The University of Michigan has installed an automotive laboratory for testing and research. The board of regents of the university has provided for the establishment of this laboratory, and has appropriated \$10,000 for its equipment.

VENEZUELA SIGNS TREATY

WASHINGTON, July 11—A commercial travelers' treaty has been made between Venezuela and the United States, similar to the treaty entered into with Uruguay, Guatemala, San Salvador and Panama.

Manufacturers and dealers, residents of Venezuela or the United States can, under the provisions of the treaty operate as commercial travelers either personally or through agents or employees, on license for a single fee, valid throughout the country. It is expected that customs formalities will be simplified as a result.

CARS INCREASE IN JAPAN

WASHINGTON, July 8—Motor cars in the Hyogo prefecture of Japan numbered 4 in 1908, 14 in 1912, 89 in 1916, and 282 in 1918. The city of Kobe is reported to have 182 automobiles.